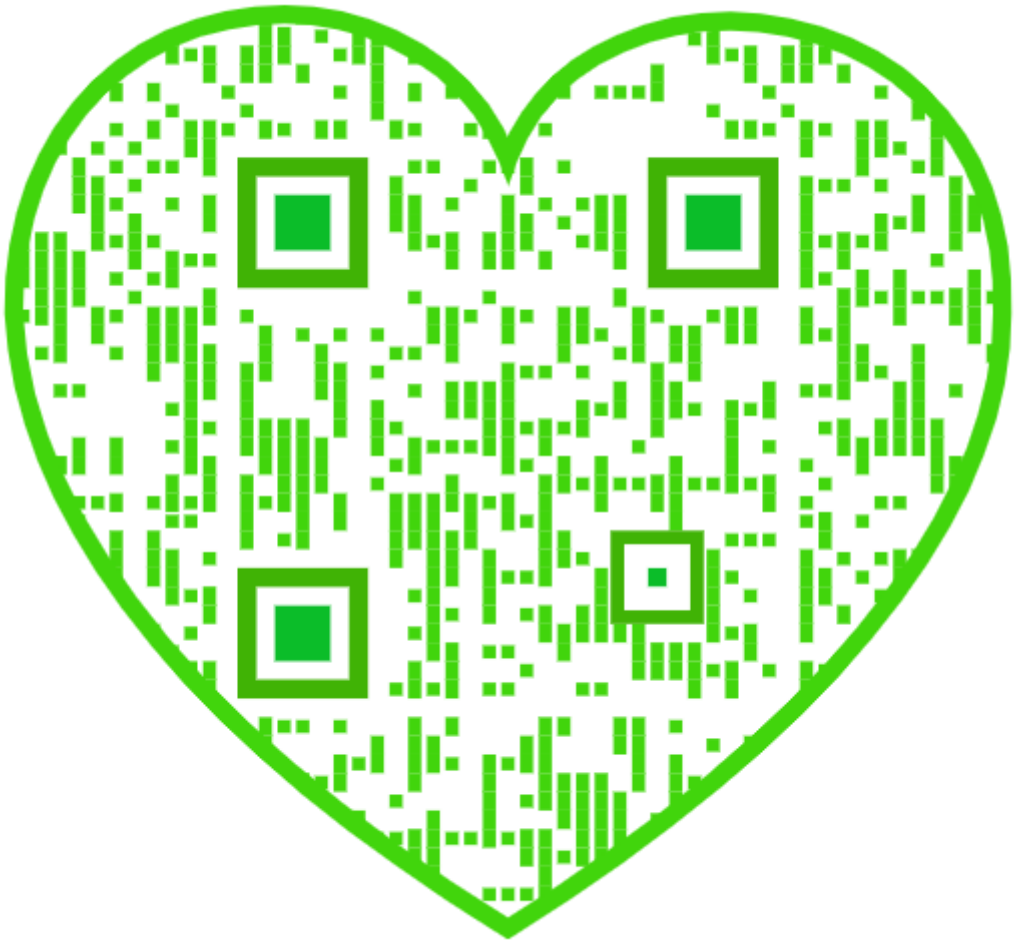
FRUITS AND VEGETABLES UNDER GLASS



FRUITS AND VEGETABLES UNDER GLASS

WILLIAM TURNER

FRUITS AND VEGETABLES UNDER GLASS

APPLES, APRICOTS, CHERRIES, FIGS, GRAPES,
MELONS, PEACHES AND NECTARINES,
PEARS, PINEAPPLES, PLUMS,
STRAWBERRIES

ASPARAGUS, BEANS, BEETS, CARROTS, CHICORY,
CAULIFLOWERS, CUCUMBERS, LETTUCE,
MUSHROOMS, RADISHES, RHUBARB,
SEA KALE, TOMATOES

By
WILLIAM TURNER

1912
A. T. DE LA MARE PRINTING AND PUBLISHING COMPANY
LIMITED
NEW YORK

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FOREWORD

A FEW years ago I contributed some articles on fruit culture under glass to The Florists' Exchange. These were very favorably received, and it was even suggested to me that I should collect all my material on this subject and put it into book form. But at that time I realized that I still lacked experience in many of the details of that pursuit which were absolutely necessary to the successful culture of the several fruits it is possible and profitable to raise under glass.

The encouragement I then received has, however, induced me at this later time, and after more extended experience, to now attempt to carry out an undertaking which, even well into its beginning, seemed a Herculean task. But, strange to say, as I began to make progress the more deeply I became interested. It was to me a relaxation from other duties, and I have found the preparation of the subject matter very companionable. Progress has been slow, as the writing could be done at night only, after the more pressing duties of the day had received attention.

There are many well-known fruit growers throughout this country who raise excellent crops and who are thoroughly familiar with the art of bringing fruit under glass to the highest state of perfection; such men need no instruction from me. My sole motive in publishing this work is to give information to the less fortunate of my brethren, those who have not had the opportunity to learn all the details necessary to the successful cultivation of all kinds of indoor fruit.

If this book will prove of assistance to the inexperienced and to the beginner to the extent of imparting new life and energy to this important branch of our profession, I shall feel repaid a hundredfold for the time and labor it has cost me. I know there is a great and growing field for this work, and I would say to all gardeners (young and old), located in establishments where there is glass to any extent but no fruit: Introduce some pot fruit, but grow it well; it may be the means of adding a fruit range to the establishment. There is no better spender in the world than the American employer, provided that returns are in sight, namely, fruit of a higher grade than can be produced or obtained in the open market.

I have endeavored to discard theory and to give nothing but solid facts and information which, I may say, it has taken me many years of close experience to collect and apply. But I now feel sure of my ground—for the greater part of my life has been spent among hothouse fruit. I do not take any credit to

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myself for whatever knowledge I may have gained in the course of this pursuit; rather would I call it my good fortune to have been kept in close touch with fruit forcing for so many years.

It has also been my privilege to work under liberal employers. This has been of great advantage in enabling me to gain valuable information in the way of testing many new fruits which have been brought to my notice.

I have tried to present all my facts in such a way that those who follow closely the methods here detailed, and which I have found successful, can achieve similar results.

Do not hesitate on the plea of inexperience. Plunge fearlessly (using your good common sense, be it understood) into this new line of work and success will follow. Growing fruits and vegetables out of season is a fascinating occupation, and time flies all too fast when we become interested in that pursuit.

I have been waiting for several years in the hope that some man better qualified than I am would come forward to discuss this important subject with a more fluent pen. It will be noticed that my method of culture varies slightly from that recommended by European writers on the subject, particularly during the Summer, when it is advisable to give more air to the plants, especially when dispensing with artificial heat, for at this season too close an atmosphere encourages mildew and kindred diseases. I have endeavored to explain all details so far as my knowledge and experience enabled me to do so.

My aim from beginning to end has been to present cultural information so plainly that any grower may, without previous experience, follow my instructions with an assurance of reasonable success. I also extend my sincere thanks to the Lord & Burnham Company for courtesies shown in furnishing me with diagrams for fruithouse construction, etc., also for the photograph of pot Grape vine in fruit, which I appreciate highly. The other photographs I myself have taken. And last, but not least, my thanks and sincere appreciation are due to A. T. De La Mare, president of the A. T. De La Mare Printing and Publishing Company, Ltd., for his kindly assistance in bringing my manuscript into presentable form.

WM. TURNER.

Oceanic, N. J., 1912.

[Situated similarly to Mr. Turner, and in the midst of more than ordinarily pressing duties, some delay since the receipt of Mr. Turner's manuscript has been occasioned in the presentation of this book, for which I hereby offer my apologies. Advantage was taken of a recent vacation, made necessary as a respite from overwork, to take up the preparation of Mr. Turner's manuscript. It has been a pleasant and a fascinating task, with my thoughts constantly dwelling on the author's juicy, luscious fruits.—A. T. D.]

CONTENTS

FRUITS UNDER GLASS

Chapter		Page
I	History of the Grape Vine	17
II	Houses Best Adapted for Growing Grapes	20
III	The Various Systems of Propagation	22
IV	Vine Borders	29
V	Cultural Directions	37
VI	Planting Young Vines	43
VII	Methods of Pruning the Vine	47
VIII	Disbudding, Pinching or Stopping the Shoots, Setting the Fruit	53
IX	Grape Thinning	59
X	Commercial Grape Culture	65
XI	Varieties of Grapes Best Adapted for Early and Late Use	67
XII	Insects and Diseases	74
XIII	Keeping Qualities of Grapes—Storing, Packing, Exhibition	80
XIV	Grape Vines Cultivated in Pots	85
XV	Peaches and Nectarines	91
XVI	Thinning the Fruit, Gathering the Peaches and Nectarines When Ripe	107
XVII	Diseases and Insect Pests That Affect Peaches and Nectarines	116
XVIII	Selection of Varieties for Forcing Purposes	121
XIX	Pot Fruit Culture and Its Advantages	127
XX	Pot Fruit—Cultural Directions and Feeding	132
XXI	Pot Fruit—Pinching the Shoot, Thinning the Fruit	138
XXII	Pot Fruit—Troublesome Diseases and Insect Pests	142
XXIII	Pot Fruit—Treatment of Trees After the Fruit is Gathered	146
XXIV	Varieties of Fruit Adapted for Orchardhouse Work	151
XXV	Fig Culture in a Separate House	158
XXVI	Melon-Growing in the House	166
XXVII	Melons—General Culture	172
XXVIII	Strawberries as Pot Fruit	179
XXIX	Secrets of Success in Strawberry Culture	185
XXX	The Hothouse Pineapple	191

VEGETABLES UNDER GLASS

XXXI	Forcing of Lettuce	203
XXXII	Cauliflower	213
XXXIII	Radishes	217
XXXIV	Tomatoes	219
XXXV	Cucumbers	226
XXXVI	Mushrooms	233
XXXVII	Rhubarb	237
XXXVIII	Asparagus	240
XXXIX	Carrots, Beets, String Beans	243
XL	Sea Kale and Chicory	248

ILLUSTRATIONS

	Page
Grape Muscat of Alexandria	18
Ground Plan for Early, Medium and Late Grapery	21
Grape Gros Colman	23
Grape Gros Maroc	25
Grape Black Hamburg	28
Section of Grapery	31
Grape Lady Hutt	36
Grape Barbarossa	39
Grape Vines Just Coming into Leaf	42
A Grape Vine Three Months Old	44
A Grape Vine Eye Just Rooted	46
A Grape Vine Showing Method of Pruning	49
Grape Alicante	55
Grape No. 1—Before Thinning	58
Grape No. 2—After Thinning	60
Grape No. 3—Same as Nos. 1 and 2 Taken Nine or Ten Weeks Later	62
Grape Madresfield Court	64
Grape Black Hamburg	71
Grape Vine, 30–40 Years Old, of the Variety Gros Guillaume	73
Grape Muscat of Alexandria	77
Grape Representing Method of Pot Culture	87
Peach Trees in Blossom	93
Section of Peach-house	95
Peach Peregrine	98
Peach Bellegarde	100
Nectarine Spencer	102
Nectarine Advance	103
Peach Bellegarde	108
Nectarine Early Rivers	111
Nectarine Newton	115
Peach Thomas Rivers	117
Peach Noblesse	120
Peach Goshawk	123
Peach Peregrine	125
Peach Thomas Rivers	125
Section of House for Pot Fruit	130
Pear Princess	135
Plum Denniston Superb	140
Pear Mme. Treyve	143
Plum Denniston Superb	147
Pear Beurre Hardy	150
Plum Oullin's Golden	152
Plum Mallard	153
Plum Czar	154
Pear Pitmaston Duchess	155
Pear Conference	156
Fig Bourjassotte Grise	161
Fig Negro Largo	165
Muskmelon, Sutton's Emerald Gem	168
Muskmelon, Turner's Seedling	171
Muskmelon Superb	176
Strawberry Sharpless	181
Strawberry Pride of Red Bank	186
Pineapple Queen	193
Pineapple, Smooth-Leaf Cayenne	197

Lettuce May King	206
Lettuce Ideal	211
Cauliflower Snowball	214
Tomato The Rochford	223
Cucumber Improved Telegraph	229
Crop of Mushrooms One Month After Bed Was Spawned with Pure Culture Spawn	232
Asparagus	241
Carrots	244
Beets	245
Bean Black Valentine	246

FRUITS UNDER GLASS

CHAPTER I

HISTORY OF THE GRAPE VINE

IN telling the story of the Grape vine there is nothing new to recount; it belongs to ancient history. The Grape is mentioned in the early chapters of the Bible, from which we learn that it was held in high esteem by the peoples of antiquity as well as of later times, who prized not only the fruit itself but as well the wine extracted from it. According to the early writers, the vine, Vitis vinifera, was cultivated in Asia and Egypt, in Greece, Italy, and other parts of southern Europe, and later in France. It is even said that the Romans attempted its cultivation in Britain during their occupancy of that land, though with poor success. This shows that the warm air of Italy is better adapted to its successful cultivation than is the damp and moist climate of England.

Vineyards are mentioned by Bede (before 731 A. D.) as existing in several parts of Britain. Even the monasteries were not complete without their vineyards. More has probably been written concerning the Grape vine than of any other fruit. It is disappointing, however, in looking over the references to it, to find so few records of value as to its actual history. Take, for instance, the Muscat of Alexandria, one of the oldest known Grapes, and still without a peer when properly handled; how interesting it would be to know the true early history of such a magnificent fruit! Many varieties have been disseminated during the past three score years, yet, if I were asked to name the two best varieties of Grapes, I should unhesitatingly say Black Hamburg and Muscat of Alexandria. The latter variety has gone under many differing names, and so-called improved varieties have been tried in years gone by. Even the much discussed Canon Hall Muscat was thought, and not so long ago, to be an improvement, and such it would undoubtedly have been but for the fact that it was almost impossible to secure from it a good set. Thus, this variety was weighed in the balance and found wanting. Strange to say, several of the leading varieties of our Grapes of today were not recognized at their true value until some years after they were first tested or raised from seed. Foster's Seedling was originated about 1835, but it was not grown to any extent until twenty-five years later; then, however, it became popular so quickly that it was found in nearly every establishment growing Grapes on any scale. Gros Maroc was introduced about 1855, from the vineyards of M. Vibert of Angers, but it remained comparatively unknown for a number of years and until T. F. Rivers received a

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GRAPE MUSCAT OF ALEXANDRIA

The finest of all hothouse Grapes. Wherever a white Grape is in demand, this noble variety should have preference over all others. Berries and bunches are large, with a rich Muscat flavor, bunches hanging on the vines a considerable time after being ripe.

first-class certificate for an exhibit thereof from the Royal Horticultural Society of Great Britain; then its popularity became established; from that time on it has graced many an exhibition and often carried off the highest honors for black Grapes. While it has not an extra rich flavor, it is popular on account of its appearance, the size of the berry, its finish, and it is also an easy doer.

The same may be said of Gros Colman. The early history of this Grape is not very clear. Mr. Thomson of Scotland was the first to recognize the possibilities of this variety for growing on a large scale for the market. Thomson & Sons, Clovenfords, Scotland, have made their name known far and wide through their success with Gros Colman as a late-keeping Grape, and today more Grapes of this variety, for a late fruit, are probably grown than of any other.

Under favorable circumstances the vine will live to a great age. There are records of vines five hundred years old. The celebrated vine at Hampton Court, England, was planted in 1769 and is still bearing annually a large number of medium-sized bunches. This is proof sufficient that the Grape vine will reach a good old age provided it is well cared for.

It is only during the past fifty years or so that the Grape vine has occupied so much space under glass, and its cultivation today does not vary to any great extent from that practiced years ago. In my younger days I have seen some very old-fashioned graperies, where the vines were planted outside and brought in through crevices in the wall, there being no inside border at all. Good Grapes may be grown in this way for Midseason, but for early forcing or for late growth it is very unsatisfactory. However, going back twenty-five to thirty years, we find some magnificent specimens of Grapes, and we have records of bunches of great weight, such as Trebbiano, weighing 26 pounds; White Nice, 25 pounds; Gros Guillaume, commonly known as Barbarossa, 23 pounds; Black Hamburg, 21 pounds. Such record weights are surely of interest to look back upon, and we can truly say that the men who grew those bunches have left these records as a monument to their skill in the cultivation of Grapes under glass. Records equal to these will not easily be eclipsed.

CHAPTER II

HOUSES BEST ADAPTED FOR GROWING GRAPES

THE advances made in recent years in greenhouse construction is simply marvelous. A few years ago we thought they had reached perfection and that it would be almost impossible to better them. But improvements have continued since then, so that it now seems to me that the professional builder will have to exercise considerable ingenuity before he can improve upon existing types. We, as growers of forced fruits, appreciate the good work which has been done along these lines. and the growers throughout the country are fully aware of the benefits they have derived from this source. I may safely say that greenhouses, such as are now erected in America, have not their equal anywhere in the world for strength, durability, and light. The greenhouse constructor is surely the grower's best friend.

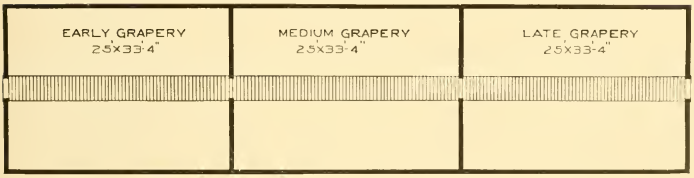
Fruit has been grown in different kinds of structures. Years ago the leanto house was much in favor, and it is still very satisfactory for climates not subject to extremes of temperature, especially for early forcing, when facing south. In such a house the desired temperature is easily maintained. But when extremes of temperature have to be reckoned with the even span is the ideal house for fruit culture. Either a curvilinear or a straight roof may be adopted. One point in favor of the curvilinear roof for private establishments is that it gives the range a neater appearance, in agreeable contrast to that of the commercial greenhouse. As to the width, a house 25 feet wide is just right, and it should certainly not exceed 30 feet. Let your fruithouses run, if possible, north and south. Complete ventilation must be provided, both for top and bottom, as free circulation of air is necessary both when ripening up the fruit and the wood.

Admitting that the greenhouse constructor has reduced the building of these houses to a science, with a thorough understanding of all the requirements of an ideal fruithouse, I do not need to go into any details along these lines. Still, a word in regard to location will be permissible. Greater success is to be looked for by selecting an elevation rather than low ground. Where fruithouses are on low ground they need close attention, as the fruit in them is more subject to mildew and kindred diseases. The ideal range will be set on an elevation and protected from the north winds or, if there exists no natural protection, a planting can be made for the purpose of furnishing a windbreak that will assume an adequate size in a few years.

As to heating, either steam or hot water may be used, but fruithouses are generally equipped with a hot water system; I, myself, decidedly prefer the

latter. There is an attribute in connection with a hot water system which gives off a mild heat, whereas the steam seems harsh and fiery.

In installing the piping to give the desired temperature it is much better to overpipe a house than to underpipe it, but this need not overheat the house, for, under most conditions, the desired temperature can be easily maintained.



This represents the ground plan for three compartments, even span house, with slat walk in the center, for Grape forcing—early, midseason and late—which, for ordinary private use, should be sufficient. Still, if desired, these compartments may be extended to any length according to demands, although I would not advocate having the grapery more than 25 feet in width. Then, by having the vines planted each side of the house, it will allow space, for training up the permanent rods on each side, of 24 or 25 feet, which is a sufficient length. Three compartments are absolutely necessary where a continuous supply is desired—say, from May 1st to January 1st. Neither would there be anything gained by having more, as this would be found to cover the season thoroughly. The same plan would be ideal for a Peach house, only have the walk around the sides instead of in the center, and plant the trees crosswise of the house, using trellises for that purpose, about 6 feet apart.

CHAPTER III

THE VARIOUS SYSTEMS OF PROPAGATION

PROPAGATION BY LAYERING—PROPAGATION BY SEED—CROSS FERTILIZATION—PROPAGATION BY INARCHING—PROPAGATION BY GRAFTING

THE Grape vine may be easily propagated and, with the proper facilities at command, there will be very little trouble, as a rule, in raising young plants. There are different methods in vogue, such as by cuttings, layering and eyes.

Fruit experts have held for many years that the plants propagated from the eyes are the most satisfactory in every respect. It should be borne in mind, however, that in order to get the best results, it is absolutely necessary that the stock selected for this purpose be thoroughly ripened wood. Although the effect of using unripe wood may not be evident when the young plants are first rooted, yet it will appear later. If two batches were put in at the same time, one with the wood thoroughly ripened and the other with unripened wood, both batches would probably root equally well, but the ripened wood, doubtless, would grow away from the other, and make much better plants before the end of the season. To the unobservant the vines, when dormant, may all look ripe. Yet there is a wide difference. Some wood will cut pithy and soft, and this is very undesirable, while the wood that cuts hard, or almost like dried wood, is ideal stock for raising vigorous plants. This may seem a point of small importance; nevertheless, the very best is none too good for future purposes, and the end in view should not be lost sight of.

The question has often been asked: When is the best time to propagate young vines? I should say from the middle to the end of January, and this for two reasons: in the first place, it gives one a good season in which to grow the canes; in the second place, by the time they are rooted, the days are somewhat longer, a circumstance which promotes the growth. Whereas, if the plants are started earlier, they run the risk of having their growth checked during the dark days of Winter. The result would be a stunted cane only fit for the rubbish pile.

As stated, select the most perfect, plump eyes, leaving about half an inch of wood on each side of the eye. A slight incision may be made on the side opposite the eye, a little below the bark; this, however, is not necessary, for the wood will callus below the eye as the bud progresses, and the roots will follow. Where

Grape Gros Colman
This picture represents the Grapes growing naturally on the vine.

a large quantity of vines is to be raised from eyes, these may be laid in flats, a couple of inches apart, first half filling the flat with soil; then a coat of sharp sand is spread on top and the eyes are pressed down until the bud is level with the sand. This method economizes space, but it has one serious drawback in that the vines are disturbed after they have started to root; as well, the first roots made by the vines are not fibrous, but straight and smooth and very easily broken.

The most successful way, and the one to be recommended, is the following: Take 3-inch pots, fill them partly with broken sod and spread about one inch of sand on top. Insert one eye in each pot, pressing the eye down into the sand until the bud is level with the sand. These pots may be put into the propagating house where there is bottom heat of about 75°, with about 70° top, setting them in some material that will prevent their drying out too often. They must be kept moist all the time, but do not saturate them. The most critical time, or the danger point, is just as the bud is beginning to leaf out. Too much water lodging around at this period is apt to cause decay. But, after the root action becomes good, there is less danger. As the pots get fairly well filled with roots, a shift is in order into 5-inch pots, still using bottom heat for a time.

When the weather gets warmer the plants may be removed from the bottom heat and grown through the Summer months in a moist, even temperature; about 80° by day and 70° by night is the ideal temperature for them. If everything has gone well they should be good, strong canes in 9-inch pots by the Fall, making good material for planting into the borders for fruiting, either in the Fall or in the following Spring, as will be explained later.

PROPAGATION BY LAYERING

I have seen excellent results obtained by merely rooting young vines and planting them at once in the Grape border at the proper distance for fruiting canes. Through this method, very strong, vigorous canes were grown the same season. I think, however, that better success is likely to be obtained by growing the canes in pots for one season, for in selecting one-year canes, one would naturally desire to have them of uniform size, whereas, if the newly rooted green vines are planted, some may grow away more vigorously than others, thus giving the canes a somewhat uneven appearance.

PROPAGATION BY INARCHING

Inarching is worthy of mention. In a grapery containing vines which are strong and healthy although of an undesirable variety, it is an easy operation to inarch other varieties thereon. The most feasible way in which to carry out this work is to raise the varieties desired in pots and to inarch them on the varieties to be discarded when large enough. Well grown one-year canes will answer the purpose. When starting up a grapery with the view to inarching, the stock destined for this operation may be brought into the same house a

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GRAPE GROS MAROC

A black vinous Grape, producing handsome bunches with extremely large berries. One of our finest Grapes in appearance, but somewhat deficient in flavor.

week or ten days later. If the pots are brought in at the time when the house is started they are very liable to begin to grow before the vines which are planted in the border. This is due to the fact that the one batch has its roots down in the cool earth, whereas the plants in the pots are in a congenial, warm atmosphere.

When the young growth is about a foot long, or, at least, while the wood is still soft, select one of the side shoots, as near the bottom of the old cane as possible, bring the green shoot of the cion down to the growing shoot of the stock; before uniting them make a slight cut on each shoot a trifle deeper than the bark, where the two shoots will be joined and tie the two together, as in grafting. Try to have both shoots of about the same size. As soon as the cion has united with the stock, begin to cut it away from its own roots, and keep the stock pinched back by degrees so as to give strength and vigor to the cion. When the latter has been fully started it usually grows very fast.

PROPAGATION BY GRAFTING

Vines also may be grafted, but this is a rather difficult operation on account of their nature. If grafted when the vine is dormant no union will take place, The most favorable time for this operation is after the first flow of sap has passed. or about the time when the vines are in bloom. However, I need not go into the details of this subject, as vines are not grafted to any extent now.

PROPAGATION BY SEED—CROSS-FERTILIZATION

Propagation by seed is worthy of notice, although this method is seldom resorted to since the vine is easily increased otherwise by propagation. While we have some excellent material for the early and Midsummer varieties, our late-keeping varieties leave, unfortunately, much to be desired; they lack that rich Muscat flavor demanded of a first-class Grape. What an achievement it would be could we but infuse some of the Muscat blood into our vinous and Sweetwater varieties, and still preserve the keeping qualities of a Gros Colman or a Barbarossa! But it seems, unfortunately, that when a seedling with a distinct Muscat flavor is raised there always accompanies it a thin skin and poor keeping qualities for late use. As an instance of this character, note Madresfield Court, one of the finest of all the black Muscats. This noble variety was obtained by crossing Muscat of Alexandria with Black Morocco; it derived its color from the vinous variety Morocco and its rich flavor from the Muscat.

The sole purpose of raising vines from seed is to obtain new or improved varieties. But if seed is taken at haphazard the chances for any real progress are slight. The variety would probably only reproduce itself or, more than likely, would degenerate. The object to be attained is through cross-fertilization and close attention is required to handle this operation successfully. When the cap is thrown off and the anthers are exposed to the light and air, then, if Nature is allowed to do her work, self-fertilization will be accomplished in a short time. To cross fertilize one variety with another, means must be taken in advance of the natural development so that self-fertilization cannot be effected. To overcome this, select, a day or so previous to the opening of the first flowers,

the bunch in which is intended to be the female or seed-bearing parent. Cut away or thin down to, say, a couple of dozen flowers, then protect this bunch against the attacks of insects, which may be accomplished by using a thin muslin bag. It will be necessary to examine these flowers closely. Just before the cap is ready to be thrown off, remove it with a pair of fine-pointed scissors and immediately cut away the stamens. This is an operation requiring care and patience. When the stamens are cut off, the pollen of the sort selected for the male parent can be applied. Experimenters will have their own preferences as to the choice of a male parent. The pollen should be applied with a very small camel's hair brush to the stigma of the prepared flower. As a precaution against any other pollen coming in contact with the bunch under operation it would be well to enclose the flowers operated upon in a loose muslin bag. This process will probably have to be repeated several times, or until the entire bunch or all the flowers have been fertilized. When the berries are set, remove the muslin bag.

Hybridizers have their own pets to select from for the seed-bearing plant. A fairly safe guide to follow, which holds good for all other kinds of reproduction, is to select a plant of vigorous constitution for the seed bearer. An ideal seed bearer would be a good Muscat-flavored Grape, with the constitution of Gros Maroc or an Alicante. The hybridizer who succeeds along these lines will leave a name behind him. While advocating this operation, I realize that it is a slow and uncertain one. Yet there is pleasure and excitement in watching the development of a tiny seedling. We know we have succeeded in raising a seedling, but what will it turn out to be? And it is the uncertainty in the raising of seedlings of flower or of fruit which stimulates our interest and excitement.

Raising Grapes from seed is a somewhat tedious process, and for that reason comparatively little hybridizing is being done It takes two to three years from the time that the seed is sown until you may reap your reward or grieve over your failure if the plant does not fulfill your expectations. There has been many a rejoicing over successful introductions, and also much disappointment over plants that did not come up to the standard set. The thing to do is to take the issues as they come, and to swallow the bitter with the sweet, although the bitter may be hard to digest at times.

If you have decided to try your luck in raising seedling Grapes it would be well to devote a small house to that purpose, for, if the seedlings are set out in a border the second season, they make better headway and in fact cause less trouble than if kept in pots. It is not advisable to keep the Grape seed any length of time before sowing, as it does not hold its germinating power as long as many other seeds do. But Grapes are readily raised from seed and do not take very long to come up, especially where they have bottom heat. The best time for planting is near the end of January. Sow the seed thinly in a small flat or pan. When the young plants have become large enough to handle transfer them to small pots and keep them growing in a moist, even temperature. Repot them during the season when necessary. It is poor policy to allow them to become pot-bound. If everything goes well the first season they will probably fruit the third season. If you give your seedlings the best of treatment and meet with fair success the fruit will repay you for your labor by its quality and abundance.

Grape Black Hamburg

A black Sweetwater Grape, excellent for early forcing or midseason, but not desirable for late keeping. One of the most useful black Grapes in cultivation.

CHAPTER IV

VINE BORDERS

Draining a Border—Fertilizer for the Border—Watering—Root Action

THERE has been much discussion in the last few years as to the correct construction of borders, and this certainly is a subject requiring careful consideration and good judgment, for on it depends the success or failure of the undertaking. We know from long experience that excellent Grapes have been grown from outside borders only. These have, however, been discarded for years in favor of a combination border, that is, a border both inside and outside. So far, especially here in the United States, the inside border has been generally used on account of the great advantages it presents. In a private establishment it gives the surroundings a much neater appearance by doing away with the unsightly outside grapery border. Still, I have no desire to discredit the outside border, but it is not necessary to make it as wide as is oftentimes done; a width of eight feet is quite sufficient, and such a structure could easily be protected against the inclemencies of the Winter through the use of a layer of leaves one foot thick, with a sprinkling of coarse manure on top to keep the leaves from blowing away. Leaves are one of the best protections against frost and a sure means of preventing the freezing of the soil.

We must furthermore consider the location. If the graperies are on low ground, confine the borders wholly to the inside. But in selecting a location for fruithouses it is much better to have them on somewhat elevated ground, as this largely avoids the danger of what I will term waterlogged bottoms, which locations are most undesirable. While Grape vines imperatively call for an ample supply of moisture at their roots in the growing season, with this there must be perfect drainage, or everything will go wrong in spite of the best of care they may receive otherwise. Where the drainage is faulty the appearance and color of the Grapes are bound to suffer.

When there is a border both inside and outside, openings or arches are left in the masonry, and it is a curious fact to note that the roots inside work their way out, especially where the outside has been prepared with the same care as the inside. There is something about the free, outdoor atmosphere which is most congenial to plant life. You will very seldom find a decayed root on the outside, but only vigorous, working roots, while on the inside many of the small

working roots often decay when they are at rest. I have observed this more than once. But when the roots have the benefit of both the inside and the outside, the vines will keep in a healthy, vigorous condition much longer than when confined wholly inside. Much may be said both for and against such an arrangement. For very early forcing this method has its drawbacks—the many roots outside are like cold feet, so to speak, but for Midseason and early Fall I strongly recommend a border of about eight feet outside. While such a border is not necessary—fruit men generally throughout this country being assured that inside borders are a success—yet I may say, without fear of contradiction, that when the roots are confined wholly inside the borders require much closer attention as to watering, feeding, etc., and, generally speaking, more cultural skill in order to produce the best results. Another important fact to note is, that the vines will retain their vigor from five to ten years longer with the additional eight feet of outside border. But this outside border must receive the same care as the inside, in the way of feeding and watering when necessary. When the vines have to depend wholly on the inside for their sustenance for a period of from ten to twelve years, it would pay to renew them with strong one-year-old canes. After a vine begins to lose its vigor, it should be removed, the border renewed with fresh soil, and a new start made.

The Grape is a robust, strong vine when grown under favorable conditions. A vine in the open ground, where Nature has full sway, will grow luxuriously, especially if set out on well drained land, but if planted on a spot with imperfect drainage its growth will be poor and its life a struggle for existence. This is a fairly good lesson to guide us in the making of a border. If the vine will flourish in well drained soil in the open ground the fact becomes very evident that good drainage is vital to its perfect development. Before proceeding further, I want to make sure of being thoroughly understood in regard to my opinion of outside borders; for very early forcing I do not approve of them.

DRAINING A BORDER

The first and most important subject to be taken up is that of drainage. In some locations the natural drainage is so perfect that it is not necessary to incur any expense on that account. But where there is the least doubt, then by all means resort to artificial drains. I will give instructions here for draining a border. In the first place, provide for an outlet for the water that may collect in the bottom. Here we see the advantage of having the fruit-house on an elevation, as the water can then be carried off with less expense. The soil must be excavated at least four feet below the level of the grapery. Then lay a tile drain down the center of the house, or houses, as the case may be, preferably a three or four-inch drain. Give this drain just enough fall the entire length of the houses to carry off the water, and leave openings 20 or 25 feet apart for catching it. The concreting of the bottom depends to a certain extent on circumstances. On a cold, clayey subsoil, a rough concrete would be advisable in order to prevent the roots from penetrating below; the center should be about six inches lower than the side so that there may be no

Section of Grapery

lodgment of water. All these directions refer to a span roof fruithouse, but the same principles may be applied to a lean-to or to a three-fourths span, only in this latter case the drain would be along the front instead of in the center. About 15 inches of drainage above this in the center, tapering off to nine inches at the side, would make a level bottom. It is immaterial what kind of drainage is used; broken brickbats are good for the purpose, with a thin layer of oyster shells on top, if available, although this is not absolutely necessary. The main object is to finish the conduit off with some material that will prevent the soil from washing through and clogging up the channel. From the drainage to the surface of the border there should be from two and one-half to three feet for soil, and then, to make the drainage doubly secure, place a tough sod, if it can be secured, laid grass side down over the drainage before any loose soil is put in. One may then rest assured that there will not be much danger of poor, clogged drainage.

The Grape vine will thrive in many differing kinds of soil, though that best adapted to a vigorous growth is a fairly heavy loam. A good rose soil is all right for the grapery. If you have pasture land at command containing good, loamy, virgin soil you may consider yourself fortunate, for this sod land is ideal and lasting. Some of the most successful borders in past years have been made with such sod land laid into the border, grass side down, without chopping or breaking the sod more than necessary. The object in using all sod only is that the soil will last and keep in a sweet, healthy condition much longer than ordinary soil. Moreover, the fibrous roots of the sod are of much benefit and the roots seem to revel in it.

If we consider that the success of the years to come depends upon this preliminary work we readily realize that the best of material to be had is none too good for the purpose. While these small details may seem expensive to the inexperienced fruit grower, they are, nevertheless, important factors toward producing fruit of the first quality. We will then have the satisfaction of knowing that the coal bill is not higher for a good crop of fruit than for a poor one, and that it will not cost any more labor to produce the one than the other. Therefore, taking everything into consideration, I venture to say, that money spent on good constructive work at the outset is capital well invested, paving the way to future success, and the eventual returns will more than repay for the outlay, provided the borders get the proper care.

FERTILIZER FOR THE BORDER

All vine borders must be enriched with some kind of manure, though no hard and fast lines can be laid down in this respect. Some soils will take more than others to good advantage. But more vine borders have probably been damaged by overfeeding than otherwise. In a border made as described, the vines will make a rapid and luxurious growth for a year or so with little or no manure added.

Now the question arises as to the fertilizing ingredients best adapted to promoting the health, vigor and fruit-bearing qualities of the vines. Farmyard manure has been used more or less for enriching the soil, though it is a

well-known fact that it decays rapidly; its virtue is soon lost and it cannot be recommended as an enduring manure. But as a top dressing, later on, when the vines are established, its influence is remarkable, either as a surface dressing or applied in liquid form. I have often thought, in my work of fruit growing, what a great advantage it would be to us if we knew exactly what our soils were composed of, for they vary considerably in their composition. If all soils were of the same nature it would be an easy matter to say how much to apply of this or that so as to get the best results.

Each and every grower must feel his own road to success as to the quantity of manure, fertilizers, etc., he shall apply. The quantities recommended here shall be small. I have found through many years of practical experience that it is much easier to add than to take away. I mean by this that, as the vines get thoroughly established after a year or so, and the roots are active, great results may be obtained by systematic surface feeding, not too heavy at one time, as this may burn the roots, but by feeding often and lightly. This question of feeding and enriching the soil is such a fundamental one and so necessary to success that a book could be written on that one subject alone. No grower will be successful to any extent unless he makes a thorough study of this important question of feeding. There is an old saying, that plants cannot talk, and this is true in a way, but the close observer can easily tell when the plant has had all that is good for it. The foliage is one of the most expressive factors in plant life. All successful, up-to-date growers make a careful study of the foliage and its condition and are greatly influenced thereby. It should have good substance and feel leathery to the touch; but, should it begin to feel brittle, then one must be quick to diminish the feeding. There are times when our foliage has been very unsatisfactory through some error of treatment, maybe poor root action. Under these conditions beware of overfeeding. In order to produce good fruit the foliage must be perfect, every vein showing up distinctly, then the fruit will finish up accordingly. But, as I have previously remarked, it would be interesting for this important work to know just what the soil should contain, as, with this knowledge, we could then supply the deficiencies.

We do know, however, that in order to grow the Grape vine and fruit it successfully, there must be more or less potash in the soil, according to its nature. This can be applied in the form of nitrate of potash or as hardwood ashes. When we have a border which contains phosphoric acid, potash and nitrogen, we have a combination of food elements that should prove satisfactory for the well-being of the vine. Bone, which contains phosphate of lime, is one of the most valuable fertilizers for the Grape border, especially toward the bottom. Use half-inch bone for this purpose, the lasting qualities of which are well known, and in the proportion of one part of bone to fifty parts of soil, with a sprinkling of potash, according to the condition of the soil; the roots will receive benefit from this mixture for years to come. If a good quality of hardwood ashes can be procured, they may be used to advantage for supplying the desired amount of potash, taking about one-third less than of the bone; the best obtainable should be secured.

These are all the food elements necessary to put into the lower part of the

border, but a great deal depends on the nature of the soil. It is an easy matter to prescribe the best soil for the purpose, but unfortunately the ideal is not always at hand though the deficiencies can be met to some extent. Should the soil be heavy, add a few loads of old brick or lime rubbish, say at the rate of one load to twenty of soil or anything to cause root action. Charcoal refuse will answer the same purpose. As we near the surface of the border manures of quicker action should be applied, such as a fine grade of bone. I will recommend for this purpose a complete fertilizer for fruit under glass, which was compounded a number of years ago by Mr. Thomson of Clovenfords, Scotland, and which still stands pre-eminent as one of the best chemical fertilizers for all stone fruit. I am informed, on good authority, that Thomson's vine manure is used more and more every year for fruit growing under glass. The gardener who once gives this manure a fair trial will always thereafter carry a few bags on hand. This may seem a somewhat strong recommendation to any one who has never used it, but I can safely say that Thomson's manure is gaining new friends every year. Therefore, a few bags of it, for the surface, is money well invested. Mix a bag of 112 pounds with four wagon loads of soil; this should be ample for the top to give the vines a good start. But it is only after the vines are well established that one begins to value this manure at its true worth as a top dressing. The vines need every season a light top dressing of soil and manure. About two pounds of vine manure to the square yard will give to the surface roots something to work on. Another light application may be given after the Grapes are thinned out, if the vine roots be near the surface. Mix a little fine soil with it and, in every case, give the border a moderate watering after applying the dressing. Should the border require a thorough soaking, this may be done a day or two before the top dressing is given, as a light watering is preferable after applying Thomson's manure.

As I have previously noted, no set rules can be laid down for feeding. When the vines depend wholly upon the inside border they require feeding oftener than when they also have the run of an outside border. And, again, as the border gets full of roots, they will naturally require more food.

There may be differences of opinion as to the best way of making a border, that is, whether the whole amount of soil should be put in at once, or whether the border should be built up in sections, about four feet wide to commence with, and adding thereto as the roots penetrate through until the border is filled. This method will work successfully. But as, in our climate, the evaporation is rapid during the Spring and Summer months, this narrow border requires water so often that I prefer to build the whole at once. With perfect drainage and care in watering during the first season there is not much danger of souring the border.

As time goes on and the vines become thoroughly established, the border must be overhauled each season before starting up the house. A plentiful supply of working roots near the surface being desirable, all the loose soil should be removed and a top dressing applied which should consist of about half soil and half rich farmyard manure with a light sprinkling of Thomson's manure

and bonemeal. This will put the border in good shape, and nothing more in the way of feeding will be needed until the Grapes are thinned.

WATERING

It should be borne in mind that when the vines are at rest the border should be allowed to get fairly dry. Under these conditions it is surprising to note the amount of water which is required to saturate the soil all through. Watering plays a most important part in the successful finishing up of the crop, just as much so as does systematic feeding. If the vines suffer for want of moisture at their roots at any time during their period of active growth, the result will be an unsatisfactory finish, and probably some of the stems of the berries will dry up or get into the condition known as "shanking." This serious trouble is brought on through careless watering, imperfect drainage, careless airing, etc.; more often by too dry a border than through an oversupply of water, for it will bear repeating that Grapes must have abundance of moisture at their roots while they are in active growth or at least until they begin to color. Then it is advisable to withhold water somewhat. The vines will much appreciate a thorough soaking at their roots just as they begin their second swelling; this will be after they have completed their stoning period; at that stage they should get this watering and, if necessary, a good feed as well. Liberal treatment at this stage will considerably increase the size of the berry. If this watering will carry the crop along until the fruit is colored, so much the better, as I do not approve of heavy watering now, if it can be avoided. The grower who allows his fruit to color between waterings will get decidedly the best finish and, without perfect finish, color and bloom, all our efforts will yield but medium results. The experienced fruit grower takes much greater pride in the color and bloom of his Grapes than in large bunches; if the two first are lacking, we have erred somewhere in our work.

ROOT ACTION

Perfect root action must be maintained to the end that a perfect crop be secured. If we find no working roots near the surface on examining the border a few years after having planted the vines, then there is something wrong, especially if the vines are confined to inside borders only. It would then be well to look for the cause and remedy the evil. If we dig down we shall probably find only long, bare roots, instead of the mass of fibrous roots so desirable for obtaining the best results, though there may be a few fibrous roots at the terminal ends. After clearing away the old soil and renewing it with a fresh, open soil, these roots may be brought a little nearer to the surface before covering them up again. If there are no fibrous roots, with a sharp knife, cut nicks here and there along the bare roots, and young fibrous or feeding roots will develop as a result of those cuts. This operation should be performed in the early Fall, after the season's wood is ripened up, but before the leaves drop, as then the roots will get a slight start. In any case, the old roots will callus where these nicks are made, and will be ready to send out fibrous roots in the Spring, or whenever the heat is turned on in the house.

GRAPE LADY HUTT

A comparatively new introduction. A white Sweetwater Grape of robust growth and good quality. Valuable for a late grapery as its keeping qualities are excellent.

CHAPTER V

CULTURAL DIRECTIONS

Airing the House

THERE has probably been more written concerning the Grape vine than about any other fruit. Different growers have, from time to time within the last one hundred years, given valuable information and cultural directions, so that it might seem as if very nearly the last word had been said as to the wonderful possibilities of the vine in northern latitudes.

Where the climatic conditions are not favorable to outdoor culture, the consumer must depend almost wholly upon the hothouse product. But that is not the case in this country, with its wonderful and varied temperatures. In the United States fruits of all kinds can be and are produced outdoors even in the northern sections. Splendid crops of Grapes are grown there, and the same fruit that comes up from the south is well known. In this land of plenty, which Nature has showered with her products, I hardly expect to see indoor Grape growing carried out on any scale as a commercial enterprise, as the outdoor competition from all over the country has a tendency to militate against its successful operation from the money point of view.

In Great Britain different conditions obtain. There mammoth establishments have sprung up within easy distance of the English metropolis during the last thirty or forty years. The largest growers are probably the Rochfords, who have nearly fifty acres under glass, about one-half of which is devoted to the culture of Grapes for the London market. This establishment alone produces hundreds of tons of Grapes every year. A few years ago I had the pleasure of visiting this wonderful plant and the sight was a bewildering one.

Rapid advance has been made here in recent years in the cultivation of hothouse Grapes in private establishments, and the greater number of the new ranges now set up include provision for the production of fruit under glass. This is not surprising in view of the high class of fruit that can be grown in this way. There is, furthermore, as an incentive, the pleasure our employers derive from the products of their own greenhouses. Grapes under glass, if properly handled and finished to the highest state of perfection, are incomparably superior to the outdoor fruit, for we have all the factors toward bringing about the best results, such as heat, moisture, etc., and, above all, there are no storms to damage the fruit, so that a bunch of Grapes perfect in finish and without a flaw may be sent to the dining table, and this the millionaire owner of the house appreciates.

Grape growing under glass is not such an expensive luxury as it might seem to the uninitiated. Naturally, it costs a little more to produce extra early fruit; still it is this same early fruit that is so highly prized. Some people still have the opinion that fruit grown under glass is of inferior quality, but the rich men are waking up to the fact that Grapes produced in their own home greenhouses are unexcelled for beauty of appearance and richness of flavor, as they are allowed to remain on the vine until fully matured, and are sent to the table within an hour after being cut from the vine. I have heard it argued more than once: Why go to the expense of growing fruit under glass yourself, when you can purchase it so cheaply in the open market? But those who ask such questions do not really know the hothouse product.

Taking up now the culture of the Grape vine from the time that the house is started until the Grapes are ripe, we are confronted with many details. In the first place, it must be understood that newly planted vines should not be started up until about the first of March, for so doing any earlier would simply be a waste of coal and as well would injure the young vines. It is best to acclimatize the vines gradually to the forcing process. After they have been forced a few seasons, they can, if necessary, be started in the middle of December, and with the temperatures that I will give later ripe Grapes may be had at any time from the 1st to the 10th of May.

Three compartments are required for a continuous succession of fruit throughout the season, one each for early, midseason and late varieties. With such facilities at command there should be a steady supply of Grapes for at least eight months out of the twelve. If we have our three compartments, the early house should be started in the middle of December, the midseason house in the first week of February, and the late house the first of April. I recommend a moderate temperature when first starting a house, especially in Midwinter, when the sap is very sluggish. It takes some patience to go into the house day after day and see no apparent change, yet we are gradually acclimatizing our vines to their season's work, although it takes a month to detect the move. Under these conditions beware of rushing on too much heat.

The method I have followed for many years with success sufficient to recommend it is to start with a temperature of 45° to 50° at night, with a rise of 10° during the day, rising five degrees every twelve or fourteen days until 65° is reached at night and 75° by day. This will be sufficient to carry the vines until they begin to bloom. Then a temperature of 70° by night and of 80° by day is in order; from this time on nothing will be gained by further raising the temperature.

AIRING THE HOUSE

At the same time the house should be aired. While this may seem a simple operation to the inexperienced, much depends on the way of doing it. The hothouse plant is subject to catching cold if not kept in a fairly steady temperature. The man in charge of a grapery must watch the airing very closely, particularly in the Spring months; and the only man adapted for this work is

GRAPE BARBAROSSA

Producing bunches of large size; best adapted for late use. The flavor of this Grape is improved by allowing the fruit to stay on the vine some time after it is ripe.

the one who loves his calling. Careless airing causes no end of trouble. I think that red spider is more often the result of careless airing than of dryness of the atmosphere, though both cause the spread of this destructive insect.

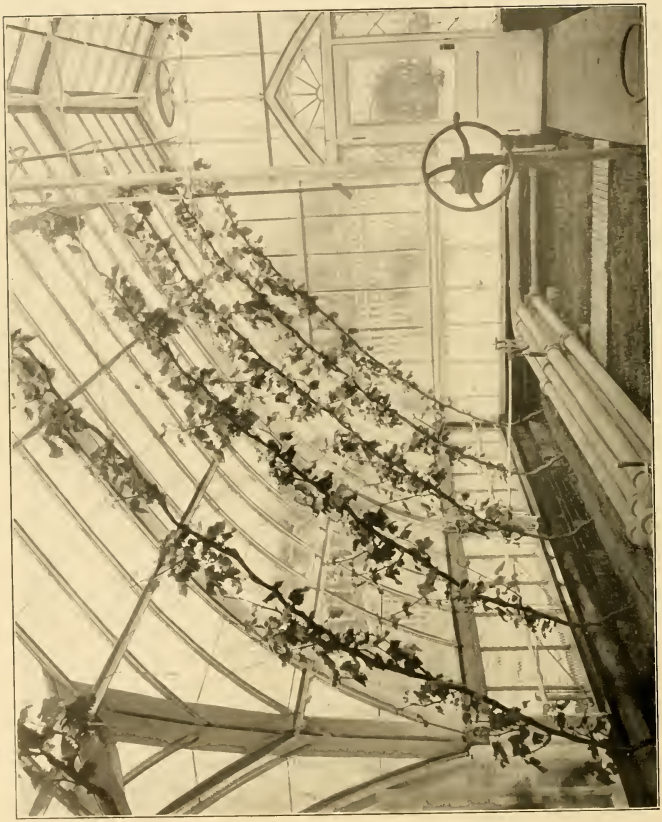
There are many details to be remembered under this head of airing, all of which must be attended to in order to grow and finish up a house of Grapes successfully. During the early forcing, the night temperature is regulated by artificial heat. Then the day temperature will be from 10° to 15° higher, according to the state of the weather. In clear weather the day temperature will naturally reach the higher mark. Still, it is not advisable to wait in the morning until the thermometer registers the day temperature, but put a crack of air on when the temperature has risen about five degrees, gradually increasing as the temperature goes up. There is one principle which must be borne in mind when airing, namely, never admit air to the extent of dropping the temperature suddenly. The air should gradually be put on and also be gradually reduced so as to have always a fairly steady temperature. As long as there is fire heat in the house we can close down so that the temperature will rise a few degrees, but after the artificial heat is suspended, which will probably be in the early part of June, leave a crack of air on, for if a house is closed tight, with no fire heat on, the condensation is too great, and this may give rise to mildew. Mildew is very destructive in a grapery, especially at that stage when the berries are small; the fungus seems to attack the bunches more readily than the foliage, and serious trouble will result when they have become infested. As the berries start to swell they are liable to crack, and as all the split berries must be cut out, considerable loss might result. With fire heat it is a good plan to close the grapery early in the afternoon, allowing the temperature to even go up to 85°. When the artificial heat is cut off, however, then mildew will spread very rapidly in a tightly closed grapery; but if you always leave on an inch or so of air, after the fires are dispensed with, that fungus can more easily be kept down. There must be plenty of moisture during the day. Vines like a moist, humid atmosphere.

From the time a grapery is started until the shoots are an inch long, they may be sprayed to good advantage three or four times a day, then twice a day until the Grapes begin to bloom. After this period it is not necessary to spray any more. If the vines are sprayed between the time of thinning up and coloring, the berries may get disfigured with the water lodging on them. The same moisture and atmospheric conditions can be maintained by dampening down the border, the walks, and the ends of the houses or any free space that can be sprinkled, but keep the water off the berries if you want perfect finish. Any one in the habit of spraying up to the coloring period may think that the red spider would now have a chance to get in its deadly work, but this need not be if you keep an even, moist temperature. It is the sudden changes in the temperature, whether it be high or low, which encourage the spread of insect life. But should the red spider make its appearance, it must be checked at once and there is nothing better for this purpose than a light dusting with powdered sulphur. Red spider does not thrive under this simple treatment, and it should be applied as soon as the pest is detected.

Airing plays a prominent part in eventual success or failure. Grapes require as much skill when they begin to color as at any other time during their growing season. If they receive a check from any cause at this stage of their development they will not finish up to perfection. It is not wise to water the border at this time if it can be avoided. But this depends entirely on the nature of the soil, some soils drying out much more quickly than others. If a border receives a thorough soaking when the berries commence their last swelling it ought to carry them over their coloring. It is the aim of fruit men to get intense color and finish. Furthermore, Grapes that color up with perfect finish will hang on the vines after they are ripe much longer than Grapes that have not colored up properly.

Airing at this stage is an important factor in the coloring process. Let up somewhat on the moisture, keep a little more bracing atmosphere. Start in with a small crack of air on the bottom vents and gradually increase. The vines should have all the fresh air possible, providing that the temperature is somewhere between 75° and 80° by day and 65° and 70° at night. Bottom air should not be used at any time through the Summer until the Grapes start to color for it causes too dry an atmosphere and the berries do not seem to swell away so freely.

It is important to observe here that when the border is well filled with roots, the vines should receive their two main feedings, the first after the Grapes are thinned and the second as they commence their second swelling, after completing their stoning period.



Grape Vines Just Coming Into Leaf

CHAPTER VI

PLANTING YOUNG VINES

Plants Rooted from Eyes — A Correct Trellis

VINES may be planted either in the Fall or in the early Spring, according to circumstances. I prefer the early Fall, as then a little root action will take place, especially if the vines are planted about the end of October or the first week in November. If neither the houses nor the borders are ready to receive them at that time it is best to wait until the turn of the season, which will be about the first of February. Inquiries have come to me at different times on the subject, and I have always recommended early Fall planting. There is, however, quite a difference of opinion as to just the best time and some of my correspondents have not been able to understand the object of planting in the Fall and letting the vines rest seemingly dormant for months. My opinion is, that of two plantings, one made in the early Fall and the other about the first of February, the former would come away the stronger of the two. Such a trial would be a fair test of the two methods.

Canes which have been grown one year in pots and thoroughly ripened are the best for planting in the border. Still, there is a great difference in the stock. I have seen so-called one-year-old canes that I would not plant at any price. Get the best canes obtainable and cut them back to within two feet. If they are good, strong canes they will be in about nine-inch pots and fairly well matted with roots. These roots must be carefully disentangled, preserving all the fibrous roots. The safest way is to knock them out of the pots the evening before planting and to place the balls in a tub of water; the soil will have fallen away by the following morning and the roots may then be easily straightened out. Spread the roots on the border and cover them with about three inches of soil. A mulch of farmyard manure may be put around the vines to prevent evaporation. Give them a light watering first to settle the soil around the roots, but do not saturate them. They may be planted one inch lower than they were when growing in the pot. Allowing the ball of earth to be thus dissolved may seem rough treatment, but if you plant your vines with the ball of earth as they are taken out of the pot you will live to regret it, for they will make but a poor attempt to grow. Another fact to be considered when planting in a newly made border is that it will probably subside somewhat; so, if the vines are tied at all, they should be tied loosely so as to allow for this subsidence.

A Grape Vine Three Months Old

PLANTS ROOTED FROM EYES

Another method of planting which has proved successful, although it is not used to the same extent as planting the ripened canes, may interest the grower who has a propagating house at his command. This method consists in planting young, growing vines. Root them from eyes at the end of January, grow them along in bottom heat, pot on when necessary, up to about six-inch pots; this will be at the beginning or the middle of May, if they have done well: they may now be set into their permanent place in the border. The only difference between planting the green vines and the ripened vines is that the former are planted without having their roots disturbed. As these roots are not pot-bound they will, if the soil is firmed gently around the ball, start off without a check. I have seen wonderful canes produced in one season by this method.

As to the distance between the canes—these are generally planted by the one rod (single stem) system. But I have seen excellent results obtained when two rods are allowed to come away from each plant. Under these circumstances they should be planted eight feet apart. But it is preferable to confine each plant to one rod. The distance apart should not be less than four feet and it is better to allow a little more. There is nothing to be gained by overcrowding, and if we consider that the side shoots extend, as a rule, over two feet, we can readily understand why fully four feet is required. In a small grapery it is desirable to set as many rods as possible, so as to get the greatest returns out of the space, but if planted closer than I recommend, it will be found a poor proposition when it is all too late to make a change

If the grapery is to be a span roof house, plant the vines as near the wall as possible on each side, at a distance of four feet or a trifle over, according as the space will work out; for instance, for a house 50 feet in length, 24 canes would be needed, 12 on each side.

A CORRECT TRELLIS

The trellis is another quite important matter to be considered. Greenhouse builders are apt to miscalculate the wiring of the house in that they do not leave sufficient space below the glass. There should be ample allowance for a good circulation of air between the foliage and the glass, otherwise there is danger of burning from the hot rays of the sun. There is nothing more unsightly in a grapery than burnt foliage, aside from the serious damage incurred. The wires for training the vines must be from 18 to 20 inches away from the glass for a fair circulation. It is in the Spring and the early Summer, or when there is not much air in the house, that there is danger of the foliage being caught by the hot rays of the sun. And, moreover, if the vines are trained too near the glass, ideal conditions are furnished for the spread of red spider, and there is nothing that fruit men dread so much as this pest.

It is a simple matter to adjust the wires for training the shoots. Usually angle iron is run horizontally between the rafters as a support. Strong screw eyes, 18 inches in length, may be screwed into this angle iron, say, about one foot apart. Then run wires perpendicularly; these should first be secured to

the cell plate, then passed through the screw eyes up one side and down the other and fastened again to the cell plate. The wires should be a foot apart all through the house. No cross wiring is required for a grapery. This, of course, explains wiring for a span roof house.

A Grape Vine Eye Just Rooted

CHAPTER VII

METHODS OF PRUNING THE VINE

Treatment of Young Canes—The Short Spur System—The Long Rod System Tying the Vines—Adventitious or Aerial Roots—Keeping the Fruit Healthy

CORRECT methods of pruning are highly important for ultimate success, and the first study in this connection is the condition of the wood. Many a fruithouse is practically left to care for itself after the season's crop has been gathered. But this is wrong, for the grapery must have the same care afterward as to watering and spraying as was given while the crop was maturing. New fruit buds have to form after the crop has been gathered, and these cannot mature perfectly if neglected in any way. The border should, of course, be gradually dried off toward the Fall, bearing in mind that the following season's crop depends entirely on the condition of this season's well ripened wood. If the wood be imperfectly ripened the results will be unsatisfactory, whether the vines are treated for the long rod system or for the spur system of pruning.

There is a difference of opinion as to the amount of frost which should be allowed in a grapery. All fruit trees are benefited by receiving a certain amount thereof, and I should recommend from 10 to 15 degrees of frost, providing the wood has been thoroughly ripened up; but in very severe weather it is advisable to turn on the heat on one side of the house, leaving the pipes empty on the other side, if the heating system will allow of this. All heating systems should be arranged with a view to such partial heating, and all piping in fruithouses should by so placed that the water can be drained off in the Fall without interfering with any other part of the range.

TREATMENT OF YOUNG CANES—THE SHORT SPUR SYSTEM

Having explained the importance of fully ripened wood to work on, I will now pass to the subject of young canes. The newly planted vines should be cut down to about one foot above the soil. These canes will naturally have made a strong, vigorous growth the first season, reaching perhaps to the top of the house. It will, to the uninitiated, appear quite a sacrifice or even a waste of apparently good stock to prune them back to four or five feet from where they

were cut before, but this operation will more than pay in the long run, as it will lay the foundation of the vine for all its lifetime, especially with regard to the spur system, which is the best all-around and most generally employed. The long rod system can be recommended only for shy setting varieties or in cases where a few large bunches are the aim. If the canes have made an excellent growth the first season, four or five feet of the new growth may be left. There should not be more growth left than will break away strong and even. General conditions and the vigor of the plant should govern this cutting, as this is the time when the spurs will be formed for another season. If we can arrange it so that our spurs will be at an even distance on each side of the cane, namely, about 15 inches apart, and we allow another four or five feet of new wood to remain each year, until we have the desired length of cane, it should take about four years, if the vines make a good growth each year, for the vine to reach the top. That is for the spurred system.

The mode of bearing of the Grape vine is different from that of many other kinds of fruit trees. With the majority of fruiting trees we can tell in the Fall what the prospect will be for the coming season, as regards a plentiful supply of fruiting wood, but with the vine it is entirely a matter of conjecture, for the bunches will spring from the young wood, sometimes one on a shoot, and again as many as three on the same shoot, according to its condition and vigor.

While the Grape vine will submit to almost any kind of training desired, the straight rod system is the best, that is, allowing one rod to a plant. I have seen as many as two or three canes taken up from the same root, training each cane apart so that the one plant would cover a space of about 12 feet if three shoots were taken up. But this is not done to any extent now and it has no advantage over the single rod system.

The Grape vine will stand hard pruning, especially when the wood is well ripened, but careless pruning will destroy a vine in a few years if too much of the young wood is left on. Such treatment will result in long, ungainly spurs, which are very undesirable. The shorter the distance which the sap has to travel along the spurs the better. And we must resort to close pruning if we want to keep our spurs close to the main stem. The object of pruning is to produce vigor. In leaving two or three buds, the terminal will come away the strongest and maybe the eyes at the back would stay dormant. Prune hard back, for one well developed bud is all that is necessary for each spur. For by pruning back to the seeming one good eye, probably one or more eyes will develop and come away in case of accident to the one intended.

The Grape vine produces, as a rule, more bunch than is advisable to be left on unless, for some reason, a certain variety is shy in showing bunches. Some varieties will occasionally show queer streaks. For instance, I have seen a Barbarossa vine show bunch freely in some parts, and again nearly absolute refuse in other places, or showing perhaps only two or three bunches on a vine, although otherwise perfectly healthy and vigorous. In a case of this kind it is well to use more potash on the border and less of other manure, as potash promotes the fruit bearing qualities of the vine.

The photograph shown on opposite page represents a vine about ten years old,

A Grape Vine, Showing Method of Pruning

showing plainly the method of pruning from year to year, on the spur system. If such a vine had not been pruned well back each year to one well developed bud the spurs would have been long and ungainly; the failure to prune back is also of disadvantage to the development of the vine, for long spurred vines will produce but ordinary Grapes. Without doubt, it takes considerable nerve to cut a vine back in this manner, for it seems as though we were leaving but small possibilities for the production of fruit for the following season.

To follow up this method of pruning successfully it is absolutely necessary that the wood be thoroughly ripened. The practical fruit grower will know, when pruning, if the wood is in good shape. The test is that the cuts in well ripened wood will dry up at once and will look almost like old wounds in a few hours. But should there be a watery fluid, or what is termed bleeding, we realize at once that the wood has not ripened up fully. While this bleeding will not kill the vine it will weaken the buds considerably. However, as a preventive, even when there are no signs at all of bleeding, it is well to put something on the cuts to close up the pores. There is a styptic preparation sold by seedsmen, but brown shellac will answer the same purpose. Unfortunately, when a vine once begins to bleed, neither of these preparations will remedy the evil. This trouble will generally be most noticeable when starting a house, for when the first sap begins to flow large quantities of water are taken up through the roots, and the probabilities are that the evil will not be adjusted until the canes commence to break into growth, which action will, of course, furnish an outlet for the surplus sap. But this bleeding will, in any case, weaken the vine considerably, and fruit men will guard against this evil as much as possible. The best preventive is ripe wood.

The question naturally follows: What is the correct method of securing ripe wood? To which we make answer: By keeping on all the air possible after the fruit is gathered, both top and bottom, gradually drying off the borders as the foliage begins to ripen, and if the vines can be given a few degrees of frost before they are started again for another crop it will benefit them. Give them treatment as near as possible to that of Nature. Do not allow the frost to penetrate at haphazard, but give them eight to ten degrees. To ripen by coddling will produce poor results.

A grapery for late use, which would be started about the first of April, must be pruned long before that date, otherwise there will be serious trouble. By that time the sap will be in action and, even with ripe wood, serious bleeding would follow. Indoor Grapes should not be pruned later than the middle of February or, better still, a week or so earlier. This refers, of course, to late houses.

THE LONG ROD SYSTEM

The long rod system, is, as I have said, not used to any extent, but if extra large bunches are desired they may be produced through this system, and it may also be applied to varieties that are shy fruiting. I have in mind a notable variety which is not grown much in this country, so far as I know, namely, the Duke of Buccleuch, which has berries considerably larger than those of Gros

Colman. The finest bunches of this variety I have ever seen were produced by the long rod method. Any other variety which is shy in producing bunches may be treated in the same way.

In the long rod system the principle is to employ one long cane as the fruiting vine, allowing another strong shoot to come away from the base, training it up for the following year's fruiting cane. The cane that produced the crop of fruit is cut away in the Fall and the new one takes its place. Thus all the two-year-old wood is dispensed with. This method is much better suited for a short span house than for a large one. Many years ago this style of treatment was much in vogue, but experience has shown that the spur treatment of pruning is the most simple and will yield a much heavier weight of Grapes, although the bunches may not be as large individually as those obtained by the long rod system of pruning. And, moreover, so much is lost as to number of bunches that the odds are considerably in favor of the system now used. Still, if you have a variety which is not satisfactory under the spur system, by all means try the long rod.

TYING THE VINES

Young vines should not be tied into position before a house is started, as the sap is liable to rush away too freely toward the terminal buds. They may be tied loosely along the side of trellises, or they may be tied half way up in position and the tops bent over and secured to a stake in the border, the object of this being to check the sap somewhat, so that all the eyes will break even. After these difficulties have been surmounted the canes should be tied up in their permanent position for, if the top shoots are allowed to take the lead, they will do so at the expense of the bottom. It is not necessary to bend the canes down as the vines get larger, especially if they are given a fair amount of time; in other words, do not rush them with too high a temperature.

ADVENTITIOUS OR AERIAL ROOTS

Much has been said and written from time to time with regard to aerial roots and their cause, that is, roots produced all the way up the vine stem. This has been attributed variously to the make up of the border, to imperfect root action, to cold, and to poor drainage, which I have not the least doubt would bring about these aerial roots. I have also seen them along the stems of vines that were started early in the season, while a later house would be entirely free of them. The make up of the border and the drainage were the same in both houses, proving clearly that close atmospheric conditions are favorable to the growth of air roots. When more ventilation is used in late Spring they perish and no harm is seemingly done by their appearance when they have been brought on by too close an atmosphere.

In general, it is impossible to give much air during January and February. But should air roots appear to any extent in the late graperies where there is plenty of ventilation, then there surely is something quite wrong. There is either poor root action, or the roots are down in a cold bottom, or both of these

conditions obtain together. But when these are present in very early graperies I am convinced that the adventitious roots are due to atmospheric causes, and the blame should not be put upon poor root action, cold feet, or any other cause outside of the close atmosphere, and for this there is no remedy until the warm weather comes in the Spring.

KEEPING THE FRUIT HEALTHY

The housekeeper is generally gauged by her cleanliness and orderliness and, similarly, the fruit man. We may produce fine bunches of Grapes, but if we are negligent in keeping our houses clean, a fine bunch of Grapes will not offset the insects, mealy bug and red spider, which we fail to keep down. To maintain clean houses requires the most constant care. Insect pests can very easily be carried into a grapery, but it is not so easy to eradicate them when once they get a foothold. One should be very cautious in allowing the man who has charge of the fruithouses to work in the planthouses, if it can be avoided, as the fruithouse may easily become infected in this way with undesirable tenants. Once they get in (and they like the atmosphere), they will spread rapidly.

All fruithouses should be thoroughly cleaned before starting them up, even if they already seem to be clean. Prevention is the best cure. Clean also all the loose bark from the vines, for if this is allowed to remain on it may become a lodging place for insects. Do not, however, strip the vines too much, but pull away only the loose bark that will rub off easily; it will not hurt the rod and may save much trouble later. For it certainly is difficult to eradicate these pests when the vines are in active growth. It is also a good plan to wash the vines with a solution of whale oil soap or Gishurst's Compound, using enough to make a good lather. If these precautions are taken, the house washed down, and all the loose soil on the border removed before putting on the top dressing, whether there are signs of noxious insects or not, there is no reason why the grapehouse and the Grapes to be borne therein should not be perfectly clean. Aside from the unpleasantness, Grapes will not keep for any length of time with mealy bug on the bunches, nor will they finish up satisfactorily. Therefore it pays to be on guard against all these evils and to fight the cause before the enemy has had time to enter, for the chances are all in favor of the bug when once he gets into the bunch.

CHAPTER VIII

DISBUDDING, PINCHING OR STOPPING THE SHOOTS—SETTING THE FRUIT

Pinching or Stopping the Shoots—Setting the Fruit—Red Spider

At this stage the fruithouse becomes interesting, for when the vines once break into growth they make rapid progress; so fast do they come along that one can almost see them grow. If everything goes well, the fruit man is generally from this time on in his glory, watching the development of the buds. When the bunches make their appearance and come up to or beyond expectation the work is an alluring one, and the man with a love for his calling will never tire of attending to all the details that go toward bringing the crop along successfully. And as we all rejoice more over a perfect crop than a poor one, it behooves us to keep our grapehouses in the best possible condition. It may seem a paradox to say that it is easier to produce a good crop than a poor one. The secret of success lies in keeping the vines up to full vigor, and to accomplish this calls for good judgment, particularly in feeding, for when a vine once loses its vitality it becomes a difficult problem to produce first-class fruit.

You take a certain pride in showing visitors through a range of fruithouses when they are in the pink of health. To note the different houses as they come along in rotation, when one is thoroughly interested in this line of work, is a pleasure which increases with each succeeding year.

Attention to many and varied details is required to carry the work to a successful issue. Disbudding is one of the first operations to be attended to after the vines break into growth. While it may seem a simple operation, the man who has this work in charge should understand all the rudiments of fruit culture under glass, and particularly as applied to young vines. All shoots not necessary may be rubbed off. In the young vines the shoots should be left as near 15 or 16 inches apart as may be, allowing for the natural distribution of the buds along the cane. As this preliminary work determines the formation of the spurs for many years to come, it should be entrusted only to a careful man, one who takes a real interest in his work. If he can manage to arrange it so that the spurs will average about 15 inches apart on each side of the cane, he will come pretty close to the mark, allowing one shoot to each spur. The leading or terminal shoot should be taken care of when but a few inches in length. Tie

it to the wire for support, for these shoots are apt to snap off when very young, and that would naturally disfigure and weaken them; we like to see this leading shoot make a good, strong growth, which means stronger shoots from this lead the following year. For spur shoots the best time for disbudding is when they are about an inch long. Sometimes three or four shoots come away at a spur; under these conditions do not take all the surplus shoots away at one time, but disbud down to two shoots, then wait a day before removing the other But disbud to one shoot before they get far advanced, as then the full strength is concentrated in the remaining shoot. After the house is disbudded to the proper number of shoots, the remaining ones must be handled carefully, for the young shoots of the Grape vine are exceedingly brittle and, when they are growing strong, in careless hands irremediable destruction may be done. If a shoot is snapped from a spur it may easily cause the loss of the spur. While such a loss may not stand in the way of a full crop, still it means a disfigurement which should be avoided.

When the shoots are disbudded, they must be tied, and this operation of bringing them into position requires as good judgment as that of disbudding. The shoots naturally draw away toward the glass when left to themselves. Yet they should not be tied too soon. Allow them to run until they get near to the glass, but keep them away from it, otherwise the foliage is apt to get damaged. Bring the shoots down to the trellis by degrees, and take your time in securing them to their permanent positions, for when they are a little older they will be firmer at the base and not so liable to snap. While the shoots are being brought down, the men working in the fruithouse should be instructed to be cautious in going through, and not to slam the doors, a bad habit that is often found among them and of which they should be broken. A sudden jar will cause a vibration overhead which would be liable to snap off the shoots if they are very brittle. The men can work just as fast with less noise. When all the shoots are tied down evenly the house has a neat appearance.

Shoots are sometimes tied straight out, on what is called horizontal training. I do not recommend this method. It is better to have the shoots inclined slightly upward, the terminal ends being a trifle higher than the base; this is a more natural position. A training at an angle between the horizontal and the oblique is a good medium between the two. Aside from the better appearance, this angle is more favorable to their growth than the horizontal position, especially so for weak growing varieties.

PINCHING OR STOPPING THE SHOOTS

As regards pinching or stopping the shoots, it has been generally recommended to stop the shoots at the first or second joint beyond the bunch. But at times the bunch will appear much nearer to the main cane, and you must use your judgment whether to stop them at one, two, or three joints beyond the bunch. The shoots should be left long enough so that when fully developed there will be foliage sufficient to cover the entire roof or trellis without crowding. Bear in mind that one perfectly developed leaf will count more than two poor

ones. But perfect foliage is impossible with overcrowding. A fairly safe method to follow is to pinch at the second or third leaf, and if the shoot is later on found to be too long, another leaf can easily be pinched back. However, it is best to do this while the wood is still soft; the length required may be easily ascertained.

Shortly after the shoot has been stopped, side shoots will appear along the new wood, commonly designated as laterals; as soon as these appear they should be pinched at the first leaf. This operation will have to be repeated several times throughout the season, according to the thriftiness of the growth, stopping

GRAPE ALICANTE

An oval, black, vinous Grape, best adapted for late use, as its keeping qualities are of the best. Merit, third rate for flavor.

at the next leaf, and so on. The leading shoot should not be so treated when needed for the purpose of extending the length of the rod, but it should be allowed to grow until it begins to crowd into other foliage; then it will be necessary to pinch it and also to stop the lateral growths. Much pinching as the Grapes begin to color is not advisable, this being one of the most critical periods in their culture; the least check at this stage may be productive of unfinished fruit and a deficiency of color. Fortunately, just about this period, the vines do not as a rule make much surplus young growth. If the laterals are gone over immediately before they begin to color it will carry them until the coloring is complete. Then again, some varieties are liable to produce split berries at this time if a few laterals are allowed to remain of a variety which are subject to this trouble. Madresfield Court, for example, must be treated very carefully at this juncture or there will be split berries, and this practically means ruination to the bunch, as all the split berries must be cut out.

SETTING THE FRUIT

In regard to setting the fruit, the general method of treating Grapes under glass here is very similar to that practiced in other countries and climates. But we have to make some allowance for our dry atmosphere as against a more moist, humid climate. I remember growing Grapes in a very moist climate, where little or no water was allowed on the border during the flowering period of the vines. But it is different here, and we can secure a better set by damping down the house lightly once every bright day, even the Muscat house, provided the atmosphere is dry toward night. In comparing the practice of Grape culture in the eastern United States with that of other countries, I have maintained for many years that we must watch our conditions here more closely, for the simple reason that generally no fire heat is used after the first week in June, our temperatures after that date being too high to require artificial heat. So, as I have said before, we cannot close up the same as with fire heat, on account of the danger of mildew. As soon as the fire heat is dispensed with, about an inch of air should be left on at all times. Or, before the fires are shut down, leave a crack of air on to accustom the vines to the air treatment. While Grapes like a humid atmosphere, the condensation is too great when the house is closed up tight with no fire heat.

Some varieties will set much more readily than others. It is discouraging, to say the least, after the Grapes have passed their blooming period, to see certain varieties swell away uneven, which will, in this case, mean seedless berries to a certain extent, and this may become a serious matter when there are not enough perfectly fertilized berries to fill out the bunch. Seedless berries at their best are small in size and they are liable to shrivel up or fall off, so they are not worth counting on at all.

Weather conditions are an important factor at the flowering period. We are all anxious to have bright sunshine, or at least some sunny weather while the vines are in blossom, even if it lasts only from ten to twelve o'clock in the morning, thus allowing the pollen to distribute itself. There must also be a

good bracing atmosphere, for the pollen cannot dry properly in a close, humid air. A little air should therefore be admitted even on dark, cloudy days. This can be regulated according to the weather. If it is cold outside, a little extra heat will counterbalance the crack of air.

The pollen should be in condition around eleven or twelve o'clock, noon, so that a gentle tap of the bunch will send it flying in all directions. If the bunch is tapped gently with the fingers around mid-day and no pollen distributes itself, this may not affect results materially for that day, but if it occurs two or three days in succession then look out for seedless berries. This applies particularly to the Muscats.

White Muscats are the finest of all the hothouse Grapes. They require close attention during the season of setting their fruit. The best and most successful way to manage is to see that the pollen gets dry, then each day, or while they are in bloom, go over each bunch about mid-day, separate and give a gentle tap with the fingers. I prefer this treatment to that of a camel's hair brush, for the Grape vine flower is so delicate that through its use one is apt to damage the stigmas or pistil. If a little air is used on the house, with extra heat in the pipes, if necessary, a good, substantial set may be obtained under this treatment, and the seedless berries will be brought down to the minimum. With very free setting varieties, such as Black Hamburg, a gentle shake of the rod is sufficient. Most of the varieties will set admirably in a temperature of 65° by night and 75° by day, but Muscats do better with five degrees higher.

When the weather is clear and the pollen has been distributed, the border may be slightly dampened so that it will dry up before night. I have followed these methods now for many years with good success. It has been the custom with many fruit growers after the fruit is all set and has begun to swell away to spray the foliage again, both morning and evening, on every clear day until the fruit begins to color. This is not at all necessary, and may disfigure the berries more or less; when there is lime or iron in the water, as is often likely to be the case, the disfigurement may be serious.

RED SPIDER

There should be very little danger of red spider if the house has received the proper care as to damping down and the keeping up of a fairly steady temperature, but if the crop receives a check through too much or insufficient heat we are preparing the way for an attack of red spider and other diseases. In growing Grapes under glass we cannot control the sun any more than when Nature takes care of them, but we can anticipate, to a certain extent, the factors making for desirable growth, as to correct temperature, moisture, etc., and if we supply these as needed, we may well feel assured of satisfactory results.

No. 1—Before Thinning

CHAPTER IX

GRAPE THINNING

THE operation of thinning the Grapes is one requiring experience and good judgment. Before starting this operation it is advisable to take into consideration the number of bunches it is desired to carry on each rod, as the vine will, in general, produce many more bunches than it should be allowed to carry. While a vine in full vigor, would, if untouched, produce enormous crops for a few years, its life would be of short duration, and its strength would become exhausted beyond the hope of recuperation. So it becomes expensive, in the long run, to leave on too heavy a crop. It is better and decidedly more economical to carry a fair average crop each year.

It is impossible to state exactly how many bunches would constitute such a crop, for what would be a fair crop for one grapery would be an over-crop for another. It all depends on the conditions. A grapery in full vigor is in condition to carry a heavier crop than one of medium vigor. The bunches, also, often vary considerably in size, and this factor must also be taken into account. I realize full well that it takes nerve and knowledge to go into a grapery, before commencing to thin the berries, and to cut away all the surplus bunches, but it is imperative that this should be done before the thinning is started. It is very hard to estimate the weight of the Grapes, too, as the bunches do not show up to advantage. I admit that it has the appearance of making a great sacrifice to cut down to the proper weight, especially if we have to prune away promising bunches, but it is not safe to leave more Grapes on the cane than can be properly finished, and this overload is not apt to be detected by the uninitiated until they begin to color.

Many a promising house has shown up well until the coloring period, and has then fallen off because the grower had not had sufficient experience and decision to cut away his surplus bunches. It is too late to do this after the Grapes have reached the coloring stage, for then the mischief has been done. Overcropping is not always the cause for Grapes not coloring; neglect in many another way will bring about the same result. But overcropping is a serious cause and we cannot expect highly finished fruit under those conditions.

I will state that, in a general way, the crop in a span roof house about 25 feet wide, with the vines in a thrifty, healthy condition and the rods fully grown, if running from 25 to 30 pounds to the rod, would constitute a good average. While this may seem to some a low ratio, yet, for private use, one perfectly finished bunch will count more than two poor ones.

No 2.—After Thinning

Grape thinning should be begun as soon as the berries are known to have set perfectly, which will be when they are about the size of small peas. As a test, if a few bunches are thinned and the work then stopped for some days, the bunches so thinned will be noticeably ahead of the others, thus showing plainly, in addition, the advantage of early thinning.

Grape thinning is tedious work, and requires considerable practice before it can be done with speed. The younger the man when he begins this work the more readily will he be able to grasp the required experience. A novice looking at a bunch just after thinning, when it appears to be a mere skeleton, may think that too many berries have been cut away. A beginner seldom cuts out enough berries at one thinning, while the experienced cutter will be able to gauge the bunch the first time.

Then, again, there are differences in varieties; some having short, stiff stems, such as the close clustered varieties Black Alicante and Gros Colman. Varieties of those types require more thinning than others which carry longer fruit stems, such as Barbarossa. Sufficient berries should be thinned out so that each individual berry has room in which to develop fully. At the same time, the bunch, when fully ripe and cut from the vine, should retain its natural shape just as it did when hanging on the vine. There is nothing more disappointing than to have the bunches spread apart. Experience is here the best teacher and the close observer will soon be able to figure out this important branch of the art.

Grape thinning, though tedious, is interesting. The bunch must not be handled or, at least, the berries must not be touched with the fingers. The correct way is to hold the scissors in one hand and a small stick in the other, either a straight stick or one with a small crotch at the end, so that the parts of the bunch can be held more securely in thinning. The inexperienced operator who may happen to be assigned to this work side by side with an expert who has been doing it for years, should not strive to keep up with the latter if he wants to thin his bunches to the best advantage, but should rather go slow at first. Speed will come only from practice.

It is sometimes desirable to tie heavy shouldered bunches, and this should be done with a small piece of raffia fastened to the largest shoulders and eased up to the cross wires. This may be done before commencing to thin, as it is then easier to operate around the bunch, but it is necessary only with extra large shouldered fruit. The photographs will explain this work and give a good idea as to how it should be manipulated.

An expert thinner can go roughly over such free setting varieties as Black Hamburg, Foster's Seedling, Alicante, and others of this type, at first cutting two or three berries at a time, after which he may adjust the bunch and thin the rest out. The main object should be to cut away the majority of the berries that are on the inside, also all the small berries or those which appear to be imperfectly set; and then to thin the rest down to the correct space. Endeavor to make the first thinning the first and last, but usually the bunches have to be gone over for a second thinning. While it may seem a waste of time to go over the work again, even an expert may miss his calculations and find it necessary to repeat the operation.

GRAPE FOSTER'S SEEDLING

NO. 3—SAME BUNCH AS NOS. 1 AND 2, TAKEN NINE OR TEN WEEKS LATER

White Sweetwater Grape, well adapted for early forcing or midseason, producing bunches larger than Buckland Sweetwater; otherwise, quality is the same.

There is a wide difference among the varieties as to the size of their berries. Gros Maroc and Gros Colman want more space in which to develop their berries than does Black Hamburg, and the latter again wants more space than a Frontignan. For these reasons it is essential that the Grape thinner become thoroughly familiar with the peculiarities of each variety under his charge. A good idea is to leave the bunch a little thicker on the top than below, as the shoulders have a chance to raise up somewhat, but leave sufficient berries to close the stem properly. This makes a more perfect finish than bare shoulders.

The photographs will illustrate the instructions, as I have laid them down. No. 1 shows a bunch before thinning; No. 2 is the same bunch a few moments later; No. 3 is the same bunch taken nine or ten weeks later, when fully matured. Each berry was given space sufficient to develop to its full size, and the bunch will retain its perfect shape when cut from the vine.

In this work of thinning, the object to be borne in mind is to thin so as to allow for the full development of the berries, but not so much so that the bunch will lose its shape after being cut.

Grape Madresfield Court

One of the very best Black Muscats. Merit, first class. Excellent variety for either early or midseason, producing large, oval-shaped berries

CHAPTER X

COMMERCIAL GRAPE CULTURE

IN countries where outdoor fruit is not overabundant, commercial Grape growing has reached enormous proportions and mammoth establishments have sprung up to supply the demands of the large towns and surrounding districts. But in the United States circumstances are different. Here we have plentiful supplies from the South, where the climate is so well adapted for the production of Grapes, as well as for many other fruits. The Northern grown Grapes also flood the markets in late Fall. I am well aware that these are not hothouse products, but, nevertheless, they all help to keep down prices to the point where there would not be much profit for the commercial grower. If Grapes could be produced commercially in late Fall and held over on the vines (as they are in climates where the temperatures are not so fluctuating or extreme) say till February and March, when fruit—or at least Grapes—are scarce, there might be some encouragement to embark in commercial Grape culture. Unfortunately, however, owing to our extreme climatic changes, Grapes cannot be kept in first-class condition after about the end of December; and even at that they would have to be the very latest keeping kinds, although, if I were going to make a venture commercially, I would rely principally upon the early varieties. With abundance of light and sunshine, we have unquestionably favorable conditions for early forcing which would enable us to get fruit ready before the glut came from the South. By starting a grapery, say 1st of December, ripe Grapes (such as Black Hamburg, which would be the best for that purpose) may be ready for market by the end of April.

It must be borne in mind, also, that Grapes can be produced on a large scale at less cost than when grown in small quantities. Ideal conditions for successful Grape culture would be a depth of a couple of feet of good, loamy soil, with a gravelly subsoil to ensure good drainage. It would then not be necessary to prepare the border—simply build the grapery and trench over the soil, adding, in doing so, a fair coat of bonemeal; then plant the vines. It would be folly to follow out this plan unless good drainage was assured; but where circumstances are entirely favorable it would effect a great saving of time, labor and money. True, a year or so would elapse before many Grapes could be gathered, but the commercial Grape grower would utilize the space in the meanwhile to bring in returns by producing Tomatoes, with little or no harm to the border. I am strongly of the opinion that very early forced Grapes would be

a better paying proposition than late kinds, for two reasons: A large quantity of hothouse Grapes are imported in late Fall and through the Winter months, the Europeans, with the advantage, especially in late Winter, of a more even climatic temperature, being able to keep them in better condition; while another factor in their favor is the much cheaper labor, which diminishes the cost of production.

It is not my desire to discourage this enterprising and interesting occupation—far from it. Neither would I feel justified in misleading anyone to this undertaking. There would, no doubt, be a brisk demand for well finished Grapes at fashionable seaside resorts during the season, for there is no Grape that would sell better in the Summer and Fall months than the Muscat of Alexandria, with its rich Muscat flavor and general high quality. Then, for a late Grape for commercial purposes, Gros Colman is by all odds preferable to any other, bearing a handsome bunch with massive berries. Other varieties might be suggested, but there are none that would yield greater returns than those mentioned.

A word may be said with regard to packing. Careless packing often results in sadly disfigured fruit. There is no better receptacle than a basket with an open top, say one which will hold 10 to 12 lbs. of Grapes. Place some soft material on the bottom; then line with wax paper, folding it over the fruit when packed, and over all tie securely a piece of strong, double paper which will serve as a lid, with the projecting handle as a protection from damage during expressage. By proper attention to these details the grower will reap his reward in an enviable reputation and a better demand for his products.

CHAPTER XI

VARIETIES OF GRAPES BEST ADAPTED FOR EARLY AND LATE USE

Best Varieties for Pot Vines—Sweetwater Grapes—Vinous Group

THERE is an abundance of varieties to select from, over one hundred having been mentioned by different writers. I will here give merely a selection of those which I have found to be the best and most reliable. It is absolutely necessary to be familiar with the quality, productiveness, finish, etc., of all the different varieties and to fully understand all their peculiarities before full confidence can be placed in them. I have had more or less personal experience with most of those that I shall recommend and any careful grower can handle them successfully and determine for himself their good and bad points. It is easy enough to set down a long list of fruit, but then the question arises of discarding the inferior.

It is impossible for anyone to attempt to grow at one time all the varieties which I am about to describe. In a private establishment where Grapes are grown only for the table, twelve to fourteen varieties, properly selected, are ample for all purposes, from the early to the late. This, again, depends on the taste of the owner or the market demand. Some families may want a large variety, while others may be satisfied with one sort if it can be made to last through the season, as, for instance, Muscat of Alexandria. But this noble Grape is, unfortunately, not a good keeper for late use, and we, therefore, have to resort to the thicker skinned kinds. But where Grapes are grown to any extent, or where there are three compartments, one each for early, midseason and late varieties, all of the midseason houses can well be devoted to Muscat Grapes. Muscat of Alexandria seems to thrive best in a house by itself. Madresfield Court Black Muscat will do splendidly in the early house, and also in the late one, but it cannot be depended upon to hang for any length of time after it is ripe.

It is when compiling a list of fruit for this work that we realize the wonderful stability of some of the oldest varieties. While new introductions are sent out from time to time, nothing has appeared to supersede the old standbys, Black Hamburg and Muscat of Alexandria. They are as pre-eminent today as they were in the years long gone by. However, there is a comparatively new Grape which is making a bid for popularity, although I have not had any expe-

rience with it as yet. This is a black Muscat, Prince of Wales, said to be an excellent late keeper and, if so, there will be room for it. The improvements made in the varieties of hothouse Grapes are not so far advanced as those made with other fruits, such as the Peach and the Nectarine, although valuable work has been done in this direction. Unavailing attempts have been made to eclipse Black Hamburg and Muscat of Alexandria, but the name of the hybridizer who succeeds in surpassing either of these two varieties will live throughout the ages.

My list of Grapes comprises varieties for early, midseason and late houses. While it is not necessary to have just the quantity named in the early and late house, all mentioned will be found adapted for the seasons recommended. If there is but one house, the selection for the early house will answer the purpose, perhaps adding Muscat of Alexandria and Gros Colman.

The Early House.—Black Hamburg, Appley Towers, Madresfield Court, Foster's Seedling, Buckland Sweetwater, Royton Muscat.

Midseason House.—Muscat of Alexandria.

Late House.—Black Alicante, Alnwick Seedling, Gros Guillaume, commonly known as Barbarossa, Gros Maroc, Gros Colman, Madresfield Court, Lady Hutt, and if an extra large bunch of white Grape is needed for late use, Trebbiano may be added. This latter sort is an excellent keeper; but aside from this qualification and its large bunches, Trebbiano may be classed as second or third rate; it may be improved somewhat by allowing it to hang on the vine.

BEST VARIETIES FOR POT VINES

While quite a number of the free setting kinds will be found adaptable to the pot treatment for fruiting purposes, there are in particular two or three kinds which can be handled with the greatest certainty of success. Black Hamburg is an ideal variety for pots, a good, clean grower which presents no difficulty whatever in securing a good stand and, above all, it will finish up to perfection with decent treatment. It must, therefore, head our list. Others are Royal Muscadine, Foster's Seedling, Madresfield Court and Gros Colman.

The following list of Grapes may be valuable. I have thought it best to divide them into three groups, namely, Muscat varieties, Sweetwater varieties and vinous varieties, with a short description of each. I will repeat that it is not advisable to try too many kinds, but rather to make a selection of those adapted to the different purposes. In compiling and grouping the list, I have purposely discarded many sorts, as it would but cause confusion to name all the known kinds which have been mentioned from time to time. Opinions may differ as to the value of my list, but such as I have included are sufficient for all practical purposes and, according to my experience, the very best and most reliable for growing under glass.

MUSCAT GRAPES

Muscat of Alexandria.—This Grape is well known for its excellent qualities, both by the grower and the consumer. The latter, especially, will always appreciate the high standard of excellence of this noble Grape. It should be one of

the leading kinds produced where there is any pretence at Grape culture. Strange to say, it is one of the oldest varieties and still the best of its class. There have been a number of so-called improved varieties begotten from it, but, so far as I know, Muscat of Alexandria is in a class by itself. While there is no Grape that will respond better to good treatment, careless management will surely bring on failure. This Grape may be grown fairly successfully in an early mixed house, but the best results will be obtained by giving it a house to itself, for it requires a longer season than many other varieties before the fruit is ready for use; it also needs a somewhat higher temperature, especially while ripening.

Canon Hall Muscat.—If this variety could be generally grown successfully, it would undoubtedly be eagerly sought after. It is rich in flavor, the berries are very large and of a deep amber color when ripe. But probably not one in twenty growers will make a success of it. It seems almost impossible to secure a satisfactory set and it is, therefore, disappointing. While I admit the excellent qualities of this Grape, I cannot recommend it highly because of its deficiencies in setting.

Bowood Muscat.—This is a variety of Muscat of Alexandria, requiring the same care and treatment. There is no great difference noticeable when seeing them growing side by side, although the berries may be a trifle rounder.

Royton Muscat.—This is an excellent variety of Muscat of Alexandria, with large, oval berries. It was introduced many years ago and is worthy of mention here. While it has all the good qualities of Muscat of Alexandria, and will grow well in association with this latter, it can be raised more successfully in a mixed house than Muscat of Alexandria, its nature being a trifle hardier.

Madresfield Court Black Muscat.—This is one of the very best of the black Muscats and, when well done, is a truly noble Grape, possessing large berries. It has graced many an exhibition board and has carried off high honors. It has stood the test for at least forty or fifty years and is still one of the leaders in its class. Though it is a Muscat Grape it does not require strong heat. Just as good results may be obtained with it in a late house as in an early one. The secret of success is not to allow any condensation to lodge on the berries when they begin to color, or split berries will surely come, disappointing the grower.

Mrs. Pince Black Muscat.—This sort is valuable for its late keeping qualities; it also thrives in a late house, as it does not require a strong heat to bring it up to its best form. It sets freely and is, generally speaking, a good cropper. Its weakest point lies in its coloring qualities, for it seldom colors up satisfactorily. Otherwise, it is a distinct Muscat Grape.

Muscat Hamburg.—This variety has been largely grown for many years. It is a bit difficult to handle, that is, in finishing up to perfection. In the first place, its setting qualities are not of the best, for it often produces a number of seedless berries; then, again, it is at times weak in color and subject to shanking in many places. It is not altogether desirable for our climate, but for a grower who can finish it up perfectly it is worthy of a place. Some of the best and most perfect bunches produced have probably been from vines grafted on Black Hamburg.

Prince of Wales.—This is a comparatively new variety. While I have had no personal experience with it the reports from across the Atlantic are in high praise of the new Black Muscat, as a free cropper, easy doer and, above all, an excellent keeper.

SWEETWATER GRAPES

Black Hamburg, like Muscat of Alexandria, really needs no special mention, being so well known. It will respond to any reasonable treatment and is not nearly so exacting in this respect as the Muscat. Black Hamburg is the friend of the amateur as well as of the skilled grower. It will adapt itself to early, midseason or late houses, but it cannot be kept long in good condition after becoming ripe. More of this variety is probably grown throughout this country than of any other Grape, and it can be relied upon to give satisfaction in every respect as a free cropper, free setter, and easy doer.

Black Prince.—While this variety cannot compare with Black Hamburg, it is still a comparatively easy Grape to grow and color up. It ripens perhaps a little in advance of Black Hamburg. It is not grown to any extent.

Buckland Sweetwater.—This is a round, white Grape, ripening at the same time as Black Hamburg. It is largely grown for early use. At its best the berries are fairly large. While this Grape will hang for some time after ripening its quality will be injured if it is allowed to hang too long, and the quality at its best is none too good.

Foster's Seedling.—This is a strong, robust grower and an extremely free setting white Grape. It is a seedling from the Sweetwater and apparently of stronger constitution. It can be allowed to hang longer than the Sweetwater.

Royal Muscadine (White).—This is a free setting Grape with medium sized berries. It is very well adapted for early forcing. The bunches will hang for a considerable time after ripening, a desirable quality, especially where there is only one grapery.

Golden Hamburg.—The name itself would denote an excellent variety and it was grown to some extent in former years. But the quality is nothing extra, and it should not be allowed to hang long after being ripe; it is a variety of no great merit.

Lady Hutt.—This is a late white Grape, admirably adapted for that purpose. It can be held in good condition until Christmas or the New Year. It is a strong, vigorous grower and a free setter. The berries are of medium size and will improve in flavor if left hanging on the vine for some time after ripening.

Duke of Buccleuch.—This is one of the largest berried Grapes in existence and, when well done, is of noble appearance. But, unfortunately, this variety is very often practically a failure; being a very thin skinned Grape it will spot easily and then begin to decay. Consequently, it cannot be kept in good condition any length of time after ripening. I have seen this Grape at its best when growing with Black Hamburg. The most perfect bunches will be found on the young wood; therefore the long rod system is the best for it.

Grape Black Hamburg

VINOUS GRAPES

Alicante (Black).—Formerly this was acknowledged to be the standard late Grape for both private and commercial purposes, but in recent years Gros Colman has outstripped it in favor. It is a Grape of easy culture, with large, massive bunches, of excellent color and heavy bloom. It is an ideal variety for exhibition purposes, but the flavor at its best is only third rate.

Alnwick Seedling.—This is valuable as a late Grape. Its keeping qualities are of the best and the bunches very handsome.

Appley Towers.—This variety makes a good companion to grow with Black Hamburg, as it thrives under the same treatment. As it takes longer to ripen its fruit, it is in good form by the time Black Hamburg is used up. While it is classed as a late grower I can secure better results with it in the early house than in the late. This Grape will hang for a considerable time without shriveling. It requires thinning out fairly well in order to allow the berries to expand to their full size, which is above the average.

Barbarossa, or Gros Guillaume.—This variety is noted for its large, massive bunches. A well finished bunch of Barbarossa is a fine sight. Still, Barbarossa has a serious fault: it will at times absolutely refuse to show fruit while otherwise perfectly healthy; on this account it is not advisable to plant more than a cane or so.

Gros Maroc.—This is a very easy doer and is recognized everywhere as an excellent variety. The berries are nearly as large as those of Gros Colman, but cannot be kept so long in good condition. With its intense black and heavy bloom, Gros Maroc makes a picture for the dinner table not easily forgotten.

Gros Colman.—This is the standard black Grape today for late work. It requires no particular treatment, being what one may aptly term an every man's Grape. It is a strong grower and always full of bunches. It should not be started up later than the first of April if it is intended to finish up before the short days set in, for it takes a longer season to color than do some of the others.

Lady Downs.—Like Alicante, this variety has been relegated to the rear in favor of Gros Colman. While it has excellent keeping qualities it is subject to scalding under our hot sun, which is a point to its disadvantage.

Raisin de Calabra.—A round white Grape of rather poor quality, but a good keeper.

Trebbiano.—This white Grape is suitable for those growers who want an extra large bunch for late use. An old acquaintance of mine in Scotland once produced a bunch weighing twenty-six pounds.

Tokay.—Has large white berries of tender flesh and fair quality, borne on large bunches. It requires a fair amount of heat to bring it up to its best. It is no longer widely grown.

Frontignan Varieties.—The Frontignans were grown years ago. While the flavor is all that could be desired, the berries and bunches are small and this, no doubt, is the reason why it has been discarded to a certain extent. Its tendency to shanking or shriveling also causes the grower considerable annoyance. But the flavor of the Frontignan varieties is pleasant. Grizzly Frontignan, White Frontignan, and Auvergne Frontignan are probably the best.

Among the new Grapes, Milton Constable, Diamond Jubilee and Lady Hastings are making bids for supremacy. They will have to stand the test of time and experience. I pass no judgment upon them, as I have not had them under observation.

Some five or six years ago a very uncommon condition was noted here in a bunch of Grapes on a Black Hamburg vine. Shortly after the Grapes were thinned I detected one bunch presenting an appearance quite different from any of the others, and when matured the berries were as large as those of Gros Colman, but with no resemblance to the variety that produced them. I raised a few seedlings of this vine, and they fruited for the first time this (1911) season, producing the exact counterpart of the bunch in question, both as to size of berries and color, which is an intense black. They ripened at the same time as the Black Hamburg, and the berries—larger, if anything, than Colman were of excellent quality. I hope to have a much finer lot in the coming season, as the vines are much stronger. The foliage is altogether different from that of the parent vine.

GRAPE VINE, 30-40 YEARS OLD, OF THE VARIETY GROS GUILLAUME, ON THE ESTATE OF BARON ALFONS DE ROTHSCHILD, WIEN, GERMANY

Weight of bunches, 3-6 kg., even up to 10 kg. Bunches often 19 x 10 in.; berries, $2\frac{3}{4} \times 3\frac{1}{4}$ in. around.

Courtesy Moeller's Deutsche Gartner-Zeitung

CHAPTER XII

INSECTS AND DISEASES

Mealy Bug—Red Spider—Thrips—Vine Weevil—Mildew—Scalding of the Berries—Rust—Shanking

IT is absolutely necessary for the well-being of the vine to keep a sharp lookout for insect pests, as great damage can be done in a surprisingly short time, particularly when the foliage is tender. Every means must, therefore, be taken to guard against those evils, which are many. In the first place, a grapery should be used to grow Grapes in and for nothing else. No plants with the least trace of insect life on them should ever enter the grapery, for this means borrowing trouble. It is much safer to keep all plants away from that building; even though they may seem perfectly clean there may be sufficient insect life hidden on them to cause trouble and annoyance for the entire season. Many of the most destructive insects are small and not easily detected without the aid of a magnifying glass. I have at times seen plants stowed away in graperies for the Winter months, subjects that did not require much heat, and from these there is probably not much danger of insect life, but even then there is always a certain risk involved when making a storehouse of the grapery. We do not treat the vines properly when we accommodate other stock in the fruithouses. Keep your graperies empty throughout their resting period; give them all the fresh air possible, with a certain amount of frost. Then they will start away, when needed, in full health and vigor. But if you coddle up your grapery when the vines are dormant for the sake of other plants you run the risk of insect pests and kindred diseases.

The treatment of insect pests and fungous diseases has been discussed by able writers, and it is not my intention to go deeply into this matter here, but I will point out some preventive measures. I believe much of this trouble is brought on by climatic conditions. In raising fruit with artificial treatment, we can select the conditions best suited to the welfare of the plant. For instance, if a grapery receives a check in the growing season, the result will be a crop of mildew or red spider, or perhaps both. This is a plain indication of neglect, or of some fault of treatment, as careless airing, too dry an atmosphere, or sudden changes of temperature. All these cause the spread of undesirable insects, with the exception of mealy bug, which is one of the most dreaded pests of

all. The humid, moist atmosphere of the grapehouse encourages their rapid increase and the bunches are their playground. The spread of mildew and red spider may be checked by maintaining a steady, even temperature.

THE MEALY BUG

While it is easy to check red spider, the mealy bug infesting the house means ruination to the crop. The best remedy is wood alcohol, applied before it becomes widespread. Keep the alcohol on hand in the grapery, and, on the first appearance of the bug, apply lightly with a brush. It is not necessary to rub the alcohol in, as you may thereby scorch the foliage, but a light touch will do no harm and is quite sufficient to kill the bug coming in contact with it. Keep the bottle tightly corked when not in use. The best opportunity to fight this pest is when the house is at rest, at which time thoroughly cleanse the vines and the house. But even then there may be enough left to cause serious trouble for another year, especially if the house was well stocked the season previous. The best time to look out for the stragglers that escaped in the house cleaning is just as the vines are breaking into growth. The bugs are then creeping from their hiding places and they should be destroyed at this juncture before they begin to multiply, for, when they once get into the young foliage, they increase so rapidly that it seems a hopeless task to attempt to eradicate them then. Though there may be a hundred and one other things to do in the Spring months, yet half an hour daily for a week or ten days devoted to fighting the bug will be time well spent.

RED SPIDER

Red spider has perhaps caused trouble to most growers of fruit under glass. This diminutive but powerful insect must be checked at its first appearance or it will soon do serious damage. While it is almost invisible to the naked eye, its destructive work becomes readily apparent when watched through a magnifying glass. It works more on the under side of the foliage than on the upper side. Its ravages can presently be detected with the naked eye, for the foliage where it is at work assumes a brownish cast. If not checked it will suck the life out of the leaves within a short time and, if let alone, might make a clean sweep not only of the leaves but also of the fruit. Its appearance depends on climatic conditions; some seasons it may bother the grower very little, while at other times it may cause serious trouble. A great deal depends on the way in which the temperature is regulated. Careless airing will bring it on just as quickly as too dry an atmosphere, or as dryness at the root. Watch these points and check the spider on its first appearance. If the vines cannot be sprayed—and this is not advisable after the berries are half grown—dust the foliage over lightly with powdered sulphur. On examining this insect through a magnifying glass we see that its body has a hairlike texture; on this the sulphur settles much to its discomfort. This method of treatment is simple but effective.

THRIPS

Thrips is not found in the grapery as often as is red spider, but it is very destructive when it does appear and difficult to eradicate. It is a long, slender insect which adheres closely to the foliage, and even spraying will hardly dislodge it. It should be cleared out at once. It feeds on the foliage in a way similar to red spider and a dry, hot atmosphere will cause it to spread apace. A mixture of sulphur and finely powdered tobacco, dusted over the foliage, is effective.

THE VINE WEEVIL

Another insect which is at times very troublesome in the early grapery is the vine weevil (Curculio vitis). In the larval state it lives in the border, and appears toward the Spring after the foliage has come out on the vine. It is a small, dark insect, very much like the rose weevil. If left alone it will do considerable damage, eating holes through the foliage, thereby weakening its action and disfiguring it, for perfect foliage only is beautiful. The only remedy is to go over the foliage carefully, picking the weevils out by hand. If they are very plentiful, spread a piece of muslin on the border and then give the vine a sudden jar and they will drop down; as they are very nearly of the same color as the soil it would be impossible to pick them up if they were allowed to drop down without the cloth spread underneath the vine. In this way one can soon get rid of them They do not seem to bother the late houses. I have at times seen a few in a midseason house, but not enough to cause trouble.

MILDEW

Mildew is one of the most serious of all the fungoid growths and, if allowed to spread, it will ruin a house of Grapes in a short time, for, when once it gets into the berries, it will cause the skins to harden, thereby checking their development. The berries are liable to split, and in this way a crop which otherwise might have been a good one will be a failure. In our northeastern climate mildew is a dreaded fungus; not so much in the early house where we have the artificial heat to combat it, but it is when the fire heat is cut off that the danger of its spread increases. It all depends on the conditions, but when once it gets a foothold among the foliage it is most difficult of eradication, and if it is allowed to get the upper hand, both the foliage and the fruit will receive a serious check. Never close the house tight when there is no more fire heat to rely on—this is the best preventive. Leave a good crack of air on at night. Then, as the temperature rises in the morning, gradually give more air. Keep the house near 80° during the day, with 70° at night, and give no bottom air until the Grapes begin to color. Under these conditions, and with a fairly steady temperature, there should be very little mildew. In closing your grapery toward evening, allow the temperature to run up the same as with fire heat. You may count yourself fortunate if you escape mildew. However, the vines must be gradually inured to this treatment and it is advisable to accustom them to it

Grape Muscat of Alexandria
As they appear growing naturally in the grapery.

before the fires are dispensed with. But with all seeming care and good judgment mildew will at times appear.

Location also plays an important part as the cause of this trouble. Graperies along the sea coast as well as those located on low lying ground are much more subject to mildew than are those situated farther inland. While Grapes clear of mildew can be produced near the sea coast they require much closer attention. The man who is interested in growing Grapes under glass will watch for the first appearance of any unwelcome visitor. If mildew is allowed to spread unchecked, even for two or three days, the damage will be great, but if preventive measures are taken at once, giving a light dusting of sulphur to the affected parts, it may check the spread. In a very severe case a little sulphur may be burned. Procure a small iron pot and an oil lamp large enough to heat this pot, then just burn a little sulphur in the bottom of it. This must be done very carefully. When the air in the house begins to get too unpleasant to stay in it, remove the lamp or put it out; have the house closed down and keep it so closed for about an hour.

SCALDING OF THE BERRIES

Scalding of the berries is a serious trouble at certain stages, the most dangerous one being at about the period of their stoning. Sometimes only a berry or two may be affected, while at other times an entire bunch may be destroyed. Some varieties are more subject to scalding than others; Gros Maroc will scald in an early house, but not in a late one, and both Muscat of Alexandria and Lady Downs Seedling will scald easily. This is caused more or less when the temperature rises and the sun strikes the berries while there is moisture on them. For these reasons the atmosphere should be watched carefully at the stoning period of the fruit; particularly does this caution apply to those in the early house. This scalding of the berries generally takes place in the morning. While the thermometer may not read high the temperature between the foliage and the glass may be quite different; for this reason the house should be aired sufficiently to take the condensation off the berries before the hot sun strikes them.

RUST

Rust is at times more or less troublesome. While it does not at first seem to hurt the Grapes to a great extent, the berries affected swelling away and developing the same as do those not affected, yet it is eventually the cause of serious disfigurement, as the marks can be plainly seen when they become ripe. Rust usually appears shortly after the thinning. It is generally ascribed to carelessness in that operation; that is, because the fingers have come in contact with the berries or, if the man engaged in the thinning is awkward at his work, allowing his hair to come in contact with the bunch. As the berries are then very tender, the skin is easily marred, but these marks will not show until they have expanded somewhat. An experienced man will guard against any part of his body or clothes coming in contact with the berries, but a novice will be apt to

twist around on the stepladder before getting into position and so may easily touch a bunch with his hair without knowing it. Therefore, it is advisable to guard against anything that may bring on rust.

SHANKING

This disease, or whatever one may choose to term it, bothers many growers. A crop may look in excellent condition up to the coloring period, and we may be elated over our good prospects when, all of a sudden, the trouble will appear. It does not take long to detect; a few berries only may be affected, or again the whole point of the bunch may be lost, spoiling its shape. It begins with the drying up of the individual fruit stem, then the berries develop no further, either in color or in flavor, consequently, all so affected are sour and useless, requiring that every berry with a dry fruit stalk must be cut out. This shanking has occurred at times with apparently perfectly healthy vines. It is due to different causes. Overcropping is a prevalent one; this occurs when more Grapes are left on the vines than the foliage is able to develop. In a broad sense, shanking is the result of some overstrain; either the root or the foliage is not performing its proper functions. This serious trouble may be attributed to different causes—destruction of foliage by insect pests, chills or sudden changes of temperature; also a border with imperfect drainage.

Grapes should be handled very carefully when they begin to color, as a check at this stage may also cause shanking and, if not that mischief, then a deficiency of color. Both of these faults are a sore trouble to the cultivator. When Grapes begin to color, more air should be admitted, but not so much as to check the crop. Many a crop of Grapes has been carried along in full health and vigor up to this stage, and has then fallen away. Shanking is further due to various other causes: if the roots get into cold subsoil, poor root action will follow; excessive dryness at the roots when the vines are in full growth—all these defects promote shanking. If the fault lies with poor root action, sour border, etc., the surest and best remedy is to clear the vines out, make up a new border and start up afresh. Vines which have fallen into an unhealthy condition may at times be brought around by renovating the border. But this would be only a halfway measure, and it is better to replant than to try to recuperate sickly, wornout plants.

CHAPTER XIII

KEEPING QUALITIES OF GRAPES—STORING, PACKING, EXHIBITION

The Cool Storehouse—Packing Grapes for Forwarding—Handling Grapes for Exhibition

OWING to our extremes of temperature, Grapes with us cannot be held on the vines as long as in more moderate climates. In our climate there is often a temperature of 90 and over in Summer, with good air. While this is congenial to Grapes before they are ripe it will not keep them long in good condition after that condition is reached. Much again depends on the keeping quality of the Grape. Perfectly finished fruit will keep in a plump, fresh condition longer than that imperfectly finished. Grapes which are inclined to be watery when ripe, possessing a very soft pulp, cannot be held long on the vines, while berries which are solid, firm, and full of sugar, instead of water, are in much better condition for hanging on the vines.

Where a steady supply is desired from an early house, do not plant it all to early kinds, such as Black Hamburg, Foster's Seedling, etc., but add Appley Towers, which would be ready for use when the earlier kinds were disposed of; include also some Gros Maroc and Muscat of Alexandria; these will follow the varieties above noted and will fill in between the early and midseason house. If it were possible to keep the Grapes in a fairly steady temperature of about 50° when ripe, they could easily be held in excellent condition for a couple of months. When the fruit is ripe it is well to shade the house lightly either with a permanent shade or by spraying some whitening on the glass. This can be done in a few minutes, and if a period of rain comes on the first shower will wash it off and leave the glass clear, which is better on cloudy or wet days. I therefore prefer the whitening to a permanent shade. The foliage of Muscat of Alexandria seems to be injured by the extreme heat of the sun in Summer, and it should be shaded somewhat from its hot rays though not so much as to exclude the light. Excellent Muscat can be grown in this way. This Grape seems to be more subject to sunburn in some localities than in others and, wherever this trouble is likely to occur, the proper preventive measures should be taken or the vines will soon deteriorate; the foliage which is the life of the plant must be protected.

In order to keep Grapes in good condition all through the Summer and sometimes into the Fall with no fire heat at all, it is necessary to keep a dry,

bracing atmosphere, with a fair amount of moisture at the roots, especially when they are depending altogether on the inside border. The berries will begin to shrivel if the border gets too dry. Toward the latter part of the Summer considerable moisture appears to rise during the night, even if the border is kept seemingly dry, and this will also cause some of the Muscat berries to decay. A light layer of salt hay will overcome this difficulty; the hay lying close down over the border prevents the moisture from rising. This simple treatment will keep the berries perfectly dry. Ripe Grapes cannot be held long on the vines with moisture lodging in the bunches, especially the Muscats.

That noble Black Muscat, Madresfield Court, is subject to one serious trouble, namely, the splitting of the berries just as they begin to color. I have overcome this difficulty by placing a coat of salt hay on the border directly under those canes, and I time the watering of the border so that it will not be necessary to give any at the roots while this Grape is coloring, for the watering in itself will cause the berries to split. Madresfield Court is one of the finest of all the Black Muscats when well done, but, unfortunately, its keeping quality is poor, and it cannot be relied on to hang on the vines for any length of time.

The late grapery is the one we have to depend upon for keeping, but even with this in view the fruit should all be colored up by the middle of October. Gros Colman is one of the standbys for late use; it will keep in a plump, fresh condition on the vines up to the first of January, and it will improve in quality by hanging. Lady Hutt also has proved admirably adapted for late use, being almost equal to Gros Colman in this respect. When grown in a late house it is not at its best for table use until about the first of December, and it improves considerably in flavor if it hangs for some time after becoming apparently ripe. The longer we can preserve the foliage the better the Grapes will keep; so, while it is not necessary to apply nearly so much moisture to the roots, yet they must not suffer from the want of it, for so long as there is foliage on the vine root action is not dormant.

The ability to hold Grapes only until January first may seem a short period. While in moderate climates they may be held in fairly good condition until the middle of February, our hot sun will often during November and at times in December run the temperature up more than is good for them, even though they be shaded somewhat, and it is these extremes of temperature which prevent holding them over longer than I have specified. If the Grapes, after being thoroughly ripened, could be kept at a steady temperature of 45°, both day and night, with a bracing atmosphere and enough heat in the pipes to dispose of any dampness during the night, then we should have the ideal conditions for holding the Grapes much longer than is now the case. But as conditions are such that we cannot maintain steady fire heat, even in the Fall at all times, enough salt hay should be placed on the border to keep down any moisture that may rise from the soil; this will prevent the damping of the berries.

THE COOL STOREHOUSE

Grapes may be kept for a long time in a room especially prepared for this purpose, but there must be all the necessary equipments, for the fruit is very

exacting in its requirements, particularly so as to temperature and dry atmosphere. This room must have a temperature of 40° to 45°, and the heating arrangements must be such that it can be turned on when necessary. The room must be perfectly dry. It should be so situated that the sun's rays will not penetrate it, so causing a fluctuation in the atmosphere, and the doors should be so arranged that no outside air can strike into the room when they are opened. A dry, close, dark room, built with hollow walls and a double set of doors, makes an ideal storehouse.

The method which is termed "bottling" is here described. Obtain as many one-quart bottles as there are bunches to cut, having necks large enough and long enough that the wood can be put in easily. Fill the bottles nearly full with clear, fresh water. Then cut the Grapes with enough wood to each bunch, so that the former will reach the bottom of the bottle and still project out of the neck about five or six inches. It is always best to place in the water the end that was cut nearest to the rod, but sometimes this is too short, especially when the bunch is near the permanent vine. In cases where the end between the bunch and the rod is too short, of course the other end of the wood must be set into the water. It does not seem to affect the keeping qualities of the Grape which end of the wood is set into the water, providing there is a clean cut at the end of the wood that is placed in the water. The only difference I have found is that the bunch as a rule will set better if the end nearest to the rod can be secured long enough so that it can be placed in the water.

A simple and inexpensive way is to arrange the bottles on shelves or racks, one above the other and far enough apart so that the bunches will not touch each other. Nail a board along the front of each rack with notches six inches apart, in which the necks of the bottles are laid. These should be placed at such an angle that the bunch of Grapes will hang clear of the bottle, while the latter itself remains nearly full of water. If the room is dry, and a steady temperature is maintained, Grapes can be kept in good looking condition in this way until far into the Spring.

While any one can prolong his Grape season by this method with the proper care, yet I do not recommend it. The Grapes lose their vitality. While they may still be good to look upon, after four or six weeks in the fruit room they will have lost their exquisite flavor and most certainly also their value as food for the invalid. Grapes must contain saccharine to be good; when they have degenerated into merely a bleb of water they may still have the name but certainly not the substance. Years ago I helped to place many a bunch in the storeroom, and have seen them come out as late as the month of April. At that time Lady Downs was one of the standards for late use, and most of the thick skinned varieties would submit to the bottle treatment. But of late years I have come to the conclusion that it is best to hold the Grapes on the vines as long as they can be kept plump. Then close the Grape season until the new crop comes along. There is no difficulty in having Grapes eight months out of the twelve, and with an interval of but four months between seasons they will be all the more appreciated when they come around again.

PACKING GRAPES FOR FORWARDING

There is another very important point in Grape growing, especially for private use; this is the packing, for generally speaking large quantities are sent away. The best methods of packing should therefore be carefully studied so that the fruit may arrive at its destination in good shape. No matter how fine the bunches are when cut off the vine, carelessness in packing will ruin them. Fruit should be so packed that it will not move when the box is turned upside down or roughly handled in transit.

Boxes holding ten to twelve pounds of Grapes are better adapted for carrying them in good condition than are larger ones. The best shape of box is one broad enough to hold the fruit in one layer, with some soft material for the bunches to rest upon. For some years we have been using a sea grass for that purpose, and have found it very satisfactory, being clean, light and elastic. Wrap each bunch separately in soft tissue paper and lay them snugly in the box with the stems upward; they will fit in better this way and will also be more convenient to lift out. Line the box with soft paper; this is to be folded over the fruit. Then fill in any crevices with sea grass or other soft material, to prevent the bunches from moving. Grapes packed in this way should be received at their destination in good condition.

Baskets may also be used and may be packed in the same way. A basket holding ten to twelve pounds is better than one of greater bulk. When the lid is down, the fruit should be snug enough so that it cannot move. Tie the handles of the basket together in an upright position; this will prevent those in charge of its transportation from placing any other weight on the basket. I have sent away considerable fruit thus packed which arrived at its destination in a satisfactory condition. There is nothing more discouraging than a report of good fruit having arrived in poor condition, and this is quite as often due to bad packing as to unnecessarily rough handling in transit. But if fruit is firmly packed in soft and elastic material it should safely stand a reasonable amount of handling.

HANDLING GRAPES FOR EXHIBITION

Grapes for exhibition purposes call for the true test of skill in packing. A bunch of Grapes destined to grace an exhibition board must be without a blemish. The bloom, or finish, which is the pride of the fruit man, can never be replaced if once rubbed off. An outsider may touch a bunch and leave his finger marks on it without realizing the disfigurement he is causing; therefore the careful exhibitor will not trust his fruit into the hands of any one else if he can possibly avoid it, but will keep close watch over it until the judges have passed upon it.

Hothouse Grapes are exhibited on stands made especially for that purpose; these are usually covered with clean, white paper. The stand is in a slightly slanting position so that the Grapes will show up to the best advantage. The size of the stand should correspond to the weight of the bunches. The Grapes

for exhibition should be cut with two or three inches of the wood attached to the bunch, giving a good hold for tying on the string. If the bunches are large, a strong piece of string is needed to secure them on the boards. It is a good plan to place the Grapes on the stands as soon as cut, and if they have to travel far, a box should be made large enough to contain the stands with the Grapes fixed thereon. Make the box wide enough so that the stands will fit one on each side, with the Grapes facing each other. Secure the back of the stand to the box with a screw to keep it from shifting. The box must be kept as nearly on a level as possible. It may be a little more troublesome to transport the Grapes in this way, but they are liable to be more or less marked if carried in baskets. And even when they are shipped on the stands the exhibitor should travel with them, lest any harm befall them, since it is his pride to show them perfect in all respects.

CHAPTER XIV

GRAPE VINES CULTIVATED IN POTS

GRAPE vines have been cultivated in pots for many years. Toward the end of the 17th century Speechley of Welbeck Abbey, England, practiced this method of cultivation. But it seems that very little advance was made from his day until about the middle of the last century. From that time on, however, the cultivation of the vine in pots has increased rapidly. This method requires great skill and close attention in order to produce high-class fruit. Furthermore, not all Grapes will adapt themselves to this treatment. A shy setting variety will be a failure. Black Hamburg is probably one of the best as a pot vine, and any other of the free setting kind will respond to this method. Muscat of Alexandria is a complete failure for pot culture.

There are many things to be said in favor of the pot vine. In the first place, we can secure ripe fruit earlier by two or three weeks than from vines planted in the border, as having the roots under our control we can ripen the wood up earlier in the Fall and they can therefore be again early started into growth. Besides, the roots are in a position to get practically the same temperature as the top. Therefore, if very early Grapes be our object, the pot system will find its place. And, again, if a fruit range is being set up for private use, the owner generally wants to secure results at once, and the two or three years required for a border seems a long time to wait.

While a couple of bunches may be allowed to remain on each cane during the second year, if all has gone well, still the pot vine will be of great assistance during the first two years. Without these one is apt to overcrop the young permanent vines, which is a serious mistake, and the consequences are difficult to overcome. I wish to impress upon the beginner in Grape culture the folly of overcropping young vines in a grapery which is intended to last for a number of years.

Grape vines for fruiting in pots are raised from eyes, the same as those intended for the border. Plants for fruiting purposes must be good, strong canes. Generally, only a few vines are needed for private use, and it is far better to purchase them direct from the specialist in that line than to attempt to grow them one's self in a house with other plants where the temperature and moisture would not agree with them. I have also seen attempts made to grow young canes in the permanent grapery and, while the atmospheric conditions here would be all that could be desired, there is the one serious drawback

of lack of sufficient sunlight. This makes it impossible to produce satisfactory canes. If the grower has a small house at command, with plenty of heat, sunlight, moisture, etc., and can devote it wholly to the young vines, then there is no reason why he should not be able to grow first class canes.

Grape vines may be grown from eyes struck in January, if given extra good treatment during the Spring and Summer months, so that the cane will be strong enough for fruiting the following season. Be sure to get the wood thoroughly ripe, and here a good, light house with plenty of sun will show results. I do not greatly believe in the drying system; neither should the pots be allowed to get dust dry at any time. While at rest, with no foliage to draw on the moisture, they require very little water at the root; but when the plant has only the pot to depend on for moisture at the root this drying process may be overdone. I have often noticed that when the soil in the pot was kept just on the moist side the roots looked much "happier" than when extra dry. The Grape vine fruits freely in the open air, while not going through the drying process; this should be a lesson to us.

While vines of sufficient strength may be grown in one season to bear fruit the following year, yet, if there is any doubt as to their strength, it is far better to cut them back again to three or four eyes, and then grow on the second year. If properly cared for, the vines will make extra strong material for fruiting. This is what we call two-year-old, cut-back.

Pot vines, when well grown, make a handsome showing, but, if neglected in any way, they are a miserable failure. A fairly rich compost should be given from five-inch pots up; a compost of sod land, plentifully supplied with fibrous roots through the sod, is good for pot work. The soil need not be too heavy, for the growing vines require a liberal supply of water. Add to this sod one third part of well decayed farmyard manure, with a sprinkling of bone and three or four pounds of Thomson's vine manure to an average wheelbarrow load of soil. This will make a fairly good compost for the vines. If it is too heavy, add some charcoal and sand, lime rubble, or anything that will keep the soil open and porous. If this compost is of such a nature that it can be used in a fairly rough state, the vines will root very rapidly through it and make a quick luxuriant growth. They must be repotted before they get in any way pot-bound, or they will get a severe check. As the vine is a liberal feeder, plenty of space must be provided for the roots. The correct shift, as a rule, is from three-inch into five-inch, from five-inch into seven-inch and from seven-inch into nine-inch, and, if started very early, they may receive another shift into eleven-inch or twelve-inch pots. In this latter case the canes should be strong enough to produce a crop of Grapes the following season. But if the eyes are started later, potting up to a nine-inch pot is all that is necessary, although this kind of stock would have to be held over. Cut back during the Winter to within a few inches of the pot, then grow on again another season. Under this treatment the vines, soon after they have been introduced to heat and before they break into growth, may be taken out of the pots, the old soil reduced, and repotted in pots of about the same size, or smaller, if necessary. Then, as the roots get active again, repot up to twelve-inch pots. The main object in

Representing Method of Pot Culture

The advantage of producing Grapes in pots is that ripe Grapes may be obtained in April, whereas, when planted in the border, May is as early as one can hope to have ripe fruit for use

doing this is to get perfect drainage, a porous soil and, above all, firm potting, all these being important factors in the welfare of pot vines. Have the potting soil of the same temperature as the soil in which they are growing. While this operation may seem troublesome, still it is best for the plant. After the vines have received their last shift, which will be some time in June, when the roots have worked through fairly well, surface dressing can be applied either in the way of top dressing or liquid manure, or both, for a good, rich soil and systematic feeding are required if the Grape vine is to reach the highest type of perfection. And an inferior Grape is not worth striving for in pot culture.

Watering plays a very important part in the success or failure of Grape culture; but this should not be done in a haphazard way. When in full growth and vigor the vines require a liberal supply of water at their roots at all times. The young roots being soft and full of sap, any drying process during their growth is apt to cause a serious check.

As regards feeding, the fruiting canes will naturally take more food to good advantage than the young canes, as will be explained later. The young vines may be sprayed two or three times a day when the weather is favorable. They like a moist, humid atmosphere during their growing season.

Vine eyes should be rooted and started along with bottom heat of about 75°, with atmospheric temperature of about 70°, or 75° with sun heat. As the season advances, the temperature can be increased. With out hot sun, bottom heat can be dispensed with in the late Spring. The young vines will make rapid headway without its assistance, in a temperature of 70° by night and 80° by day. Keep the house charged with moisture until the canes commence to ripen up, and then gradually admit more air, with less moisture to the roots and atmosphere.

Different methods are used for training the vine for fruiting. Probably the one most in vogue is to coil the cane around stakes, four or five feet high, driven into the soil, three or four around the side of the pot; or the cane may be trained to one center stake to a height of 3 or 4 ft. with a trellis on top similar to that used for training a standard Chrysanthemum. Such training makes a neat appearance, and the bunches are formed where they can receive more light and air than if trained in a coil. In preparing the young canes for fruiting, they may be grown in a light house, with one stake to each vine, setting them far enough apart to allow the sun and air to get around them. Do not crowd them in any way, but secure the young vines to the stake as they grow. A still better location is a small span roof house. Here train the young vines up a trellis, 15 or 18 inches from the glass on each side, in such a position that the buds will ripen to perfection. The lead should not be stopped until grown to the desired length, which will be from eight to ten feet, according to the strength of the cane. As the laterals make their appearance, they may be stopped, as recommended for permanent vines. The wood must be thoroughly ripened, for even if the canes are strong, they will be of no use if they are soft and pithy. I would rather have small canes than strong ones which have not gone through the ripening process. Properly ripened canes should present no difficulty if they have been grown through the Summer months in the full sun. When they are

full grown, gradually give more air and less moisture until toward Fall, at which time air should be admitted freely both night and day, and they should receive considerably less water at the roots, although the latter should not suffer from lack of it. The temperature of the house will count as much as anything. Maintain a dry, bracing atmosphere when ripening the wood.

Fruiting canes which it has taken two years to produce must be started into growth with a fairly low temperature, like that recommended for permanent vines. If they are started at too high a temperature, they are apt to come away weak. Give them time and they will more than repay for it later. Attend to the repotting when needed, but do not pot too late in the season, for it is much better to have them well rooted when they are finishing up their growth. They will not need repotting when started again for fruiting. Keep room for top dressing. During their resting period they can be pruned and the canes shortened when necessary. If the canes are strong and thoroughly ripened wood, eight feet will be none too much, but if they are weak, six feet is better.

The pot vine finds its place in fruiting and ripening, especially for early work. If Grapes are desired in April, those in the permanent house would have to be forced more than is good for them, and even then it is a question if ripe fruit can be obtained by the first of May, whereas with pot vines there is no difficulty in having ripe Grapes by the middle of April. Sometimes a couple of weeks will count a great deal, where money is no object, providing that the results are forthcoming.

The varieties best adapted for pot work are Black Hamburg, Foster's Seedling, Royal Muscadine, and Black Alicante. The last named, while having all the free setting qualities and being a strong, robust grower, takes a much longer season to ripen its fruit, and then it is of poor quality; so it may be omitted if early fruit is the object. I have seen fairly good Madresfield Court Grapes grown under this treatment.

Pot Grape vines for fruiting may be started toward the end of November, provided they have been prepared for this early start by having the vines ripened up some time in advance, as all fruit must have a period of rest between crops. In order to obtain the best results, bring them along gradually, at first in a temperature of 45° to 50° by night with an increase of 10° or 15° during the day, according to the weather. Then gradually raise the temperature as the buds begin to swell, or use the treatment recommended for permanent vines, as to temperature, atmosphere and airing.

When the pot vines are first brought into heat, they should receive one good watering, and no more until it is absolutely necessary, for as there is no foliage to draw the moisture, watering at the roots must be done with judgment in the beginning. Keep them on the dry side until they have started into growth; as the foliage gets more plentiful, increase the moisture, and from that period until fully ripe they should not suffer for lack of water. If a vine flags for want of moisture at the roots, give it a good soaking; the foliage will revive and look bright and happy again, within a few hours. But if this should occur often, the crop would be a disappointing one as to finish, and some of the stems would probably shrivel up or shank. This would take all the pleasure

and glory out of the work. However, if a pot vine is properly handled, in a twelve-inch pot, it should yield eight to ten pounds of Grapes, especially with systematic feeding with both top dressing and liquid manure. For the top dressing Thomson's vine manure is ideal. Use eight or ten parts of soil to one part of Thomson's manure, and apply about a good handful to a pot whenever it seems necessary. The most successful time to feed is after the Grapes are thinned, and again as they commence to swell away after stoning. Of course they will need light feeding between these periods, but do not feed them while they are coloring.

It is not often necessary to repot; in fact, they will do better if they can be carried through successfully with the aid of feeding and top dressing only. But sometimes there may be a pot which does not look happy, through some unforeseen cause, and it then may be necessary to repot it. The best time to do this is just as the fruit is set, for at this stage the vines appear to make roots rapidly, and this gives them a better chance to recuperate quickly.

CHAPTER XV

PEACHES AND NECTARINES

Budding— Houses Best Adapted for Growing Purposes—Borders and their Construction—Planting—Cultural Directions—Disbudding and Tying the Young Growths

THE early history of the Peach is obscure. Some authorities suppose it to be of Persian origin, but it is not definitely known where it had its first home. The Peach and the Nectarine may be classed together, as the latter is a variety of the former. The foliage and the blossom are the same in both, while the fruit is quite distinct, in appearance as well as in flavor.

Fine Peaches can be grown throughout this country without any glass protection whatever. But this is not the case with the Nectarine. Our so-called California Nectarines are Nectarines only in name. Plant a Nectarine tree under glass and give it the proper care and you will get fruit of handsome appearance and rich, luscious flavor. Prof. Bailey speaks in his Encyclopedia of the Nectarine as being inferior to the Peach in quality. But this is probably because less attention has been given to the improvement of the varieties. A wonderful improvement has, however, been made within the last twenty or thirty years, both in its size and flavor and in the length of its season. Some years ago Lord Napier was considered our earliest variety. Then came Early Rivers, ripening some time ahead of Napier. Their competitor, Cardinal, was eight or ten days in advance of Early Rivers. and for late fruit, Victoria, that grandest of all the late Nectarines, which is a monument to its originator. There are others, which I will mention later.

We have now a wonderful assortment of both Peaches and Nectarines to select from for forcing purposes. They are next in popularity to the Grape, and justly so. The demand among the wealthy for hothouse Peaches and Nectarines has increased to such an extent within the last few years that this branch of our profession will be a growing one for a long period to come.

The Nectarine is more popular as a forced fruit than the Peach, its distinct flavor being the more desired. But the fruit must be finished up to perfection in order to acquire this rich flavor, and it must be gathered at the proper stage. As regards hothouse Peaches, one must be in close touch with the fruit to appreciate its richness of finish and flavor. One fact that appeals strongly to the owner of a peach-house is that there is no off year, but a steady crop year after year, unless there has been poor judgment in overcropping, or mis-

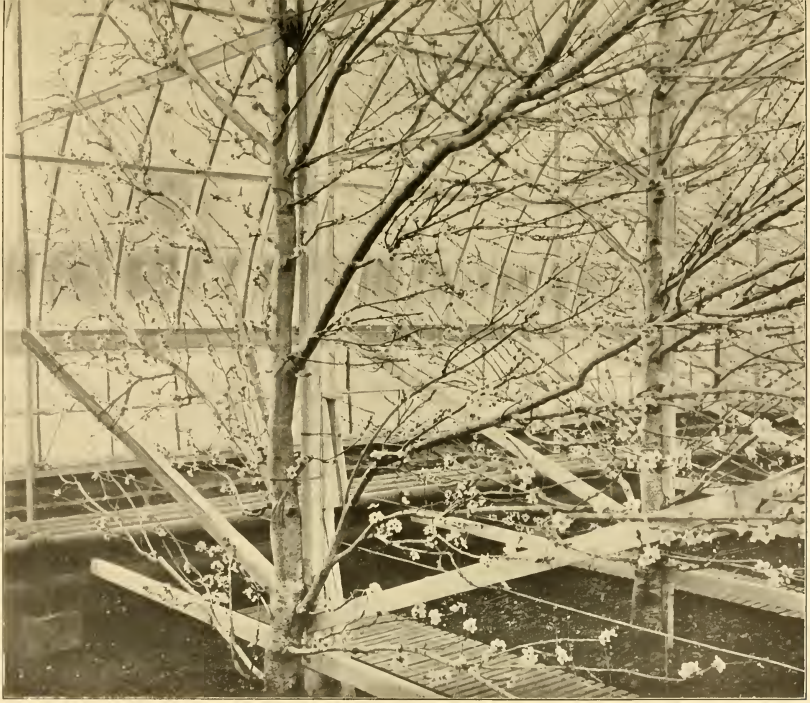
management somewhere else. The owner of a peach-house has a perfect right to expect a fair crop every year. We have no unfavorable weather conditions to contend with, and no Spring frosts to fight. We have the means at command for creating the ideal Peach temperature. Yet more Peaches have probably been damaged by too much heat than by anything else, particularly in early forcing. On the Peach tree, when brought along with Nature's temperatures, the blooms will start swelling in a comparatively low temperature. This shows that we would be going against Nature by rushing in much heat when first starting up a house. Although we may have artificial heat at command, it needs judgment to start up a fruithouse in December. Follow the guidance of Nature as much as possible. When the buds commence to move, gradually increase the heat. Too much heat will cause the fruit buds to drop, or if they do not drop, the blossoms will be weak and lack substance very undesirable. Under these conditions the flowers are apt to fall off before the fruit has set.

In our climate we can produce wonderful results with the Peach and Nectarine under glass. The trees will make rapid growth. In three or four years they will grow into large trees capable of carrying a crop of 200 fruit to the tree, or more. The wood should be thoroughly ripened up in the Fall, as the amount of sunshine is much greater here than in less favored climates, with the result that the trees will withstand 20° or 25° of frost in the house, with no injury whatever to the buds. I think that the trees are considerably improved by a certain amount of freezing. Some good fruit growers will not allow much frost in the house, but if the trees are well ripened, frost is beneficial rather than harmful.

The general method of propagation is to plant the stone of the Peach or Nectarine, with a view to obtaining new and improved varieties. This is not done haphazard, but promising varieties are selected and certain flowers are fertilized with the pollen from another kind. A record of this operation is kept. Wonderful results have been obtained by crossing the Peach with the Nectarine. One of the most prominent and handsome midseason Peaches which we have for forcing purposes is Peregrine, a seedling from the Spencer Nectarine. No collection is complete without the Peregrine Peach. It is comparatively new, but all who have tried it speak highly of it for indoor work, because of its flavor and handsome appearance.

BUDDING

Most of our Peaches are probably budded on the Peach stock, although this stock is very undesirable for forcing, as the trees have a tendency to rank growth. All Peaches for growing under glass should be budded on Plum stock. At times the wood of the Peach will grow away more rapidly than that of the Plum and, if left to itself, it would get what we term hide-bound. But a straight cut through the bark of the Plum will often remedy this evil, especially if done in time. Another point in favor of the Plum stock is that the Peach borer, which is troublesome under glass as well as in the open, will make less headway on this stock than on the Peach, for the latter is somewhat softer and more easily bored into.



PEACH TREES IN BLOSSOM

This photograph represents the Peach tree in bloom; also the method of training on trellis crosswise of the house

Both the Peach and the Nectarine are admirably adapted for forcing purposes; but while excellent Peaches can be also grown on the farm and in the garden in many parts of this country, outdoor culture is not as congenial to the Nectarine as the hothouse. I therefore rank the Nectarine ahead of the Peach for forcing, for two reasons. In the first place, one can see car loads of Peaches in the market, in their season, but not of Nectarines. The connoisseur, moreover, will prefer at any time a hothouse Nectarine to a Peach. In the second place, produce something under glass that is not so plentiful in the market and it will be more highly appreciated, provided the quality is excellent. I would therefore assign the prominent place in the fruithouse to the Nectarine.

Do not imagine that because they are not seen much in the market, Nectarines have not kept pace with Peaches as regards improvement in varieties. The Nectarine has been improved to a wonderful extent in size and flavor, and length of seasons One must know these hothouse products well in order to appreciate them at their full value.

I have often been asked how early I can produce ripe Peaches and Nectarines and how long the season will last. It is well for the grower to be able to answer such questions definitely and intelligently. So I may say here, that ripe Peaches and Nectarines can be had from the first week in May onward and, with space at command, a continuous supply may be secured from that date to the first week in October. There are persons who expect to get ripe Peaches for Christmas, but as we are dealing with a deciduous tree, which must have its period of rest, it is not advisable to attempt to bring in the crop before the date stated. Three houses are necessary in order to produce a steady supply for five months, and even then good judgment is required, with a thorough knowledge of the different varieties. This is a point that should be well considered when growing fruit for private purposes, as a steady supply is much more appreciated than a large crop ripening only within a limited period. Further on I shall give a list of varieties, with their seasons of ripening, which vary considerably.

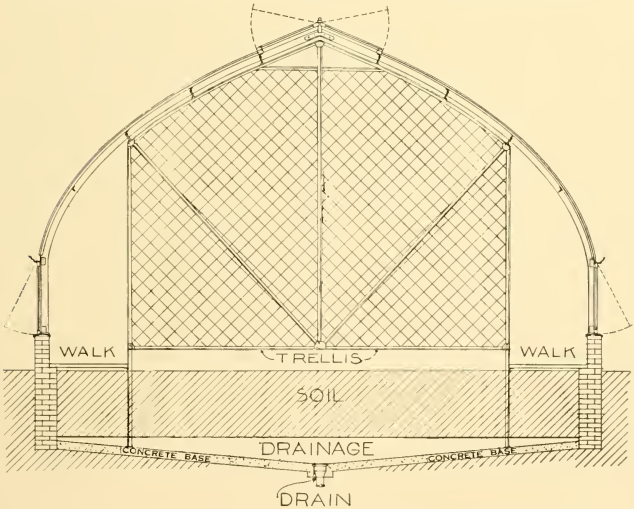
HOUSE OR HOUSES BEST ADAPTED FOR GROWING

I have seen Peaches grown in various kinds of houses—leanto, three-quarter span, and the span or even span, the trees seemingly doing well under any one of these constructions. There is one important point to be noted in planning a house for trees of this kind. When they are once planted in the border, they make rapid growth, therefore allow them room enough to spread. A Peach tree planted in a cramped position cannot be expected to develop, or to give the same results, as one that has plenty of space. A tree should be planted so that it can develop freely on both sides. An evenly balanced tree will thrive better than one which has not the same space for arranging all its branches; such a tree also means even circulation of the sap.

The house must also have full sunlight, for no matter how well it may be constructed otherwise, it will fall short of its purpose if it is in the least shaded by trees, and the grower cannot then produce the best results. The kind of

house best adapted for this work is a span roof. Let it run north and south, for the trees will get more even sunlight from this direction than if it runs east and west. All fruithouses should be supplied with both top and bottom ventilation; this is of decided advantage when ripening the fruit, particularly Peaches and Nectarines.

I have grown this fruit by different methods of training in former years. The trees were then largely planted along the sides and trained to trellis, in the same way as recommended for Grapes. Good fruit can be produced with this method. But here, with our extremely hot sun, there is considerable difficulty in keeping down red spider, as the grower can only spray the foliage on the under side. The heat between the foliage and the glass is at times very great, and that space is really a breeding place for red spider. For the last few years I have been planting and training my trees crosswise of the house. This method makes a lighter house, as the glass is free from foliage. Moreover, considerably more square feet of space will be obtained under the crosswise system. In order to get the full benefit of such a house, the walks should run



Section of Peachhouse

This section gives a clear idea as to construction of trellis, arrangement of border and concrete bottom. From the concrete base to the straight line should be filled in with drainage—either broken stone or brickbats

along the sides, instead of down the center. Have the house 25 feet wide and as long as is necessary. This will allow one tree for each trellis and a spread of 17 or 18 feet for the development of the tree, which is none too much. As regards the space between each trellis, six feet apart would be all right. Being trained crosswise, the trees are easy to handle, and there will be no excuse for red spider, as they can be sprayed on both sides. And above all, this arrangement will give the house a more handsome appearance than if the trees are trained up the roof If it is not convenient to have a span roof house—which is the best for the purpose—excellent Peaches may be grown in a leanto or a three-quarter span, provided such a house be situated in a proper location. Such a house should face south, or approximately so, in order to get the benefit of all the sunlight. Greenhouse builders have now so thoroughly mastered this subject that they are figuring out every detail to the best advantage, in regard to location, sunlight heat, etc., and the private grower can safely rely on their judgment.

BORDERS AND THEIR CONSTRUCTION.

Peaches may thrive and bear heavy crops in different soils—either a sandy soil or medium loam; but they do not look happy when planted in heavy clay soil, for they have then to struggle for existence, and the growth is slow. We find the same condition with Peaches growing in the open. I do not know any fruit more sensitive to poor drainage than the Peach and Nectarine. Although they require an abundance of water at the roots in their growing season, especially when in full growth, the drainage must be in condition to carry off all the surplus water.

As to the border, excellent trees may be grown in seemingly very small, shallow borders, or equally well with considerably more soil. I remember seeing, many years ago, some fine Peach trees growing at the back wall of a leanto house in a border about three feet wide and two and one half feet deep; they were remarkably healthy and carried fine crops every year. Trees in such a confined border need close attention as to watering and feeding when developing their crops. This shows that Peaches may be produced in a comparatively small border if the circumstances demand it. It is not so much a question as to the size of the border, for a tree may be grown in a tub 16 inches square, and yield 50 to 75 well developed fruits, with systematic feeding and close attention to all details.

One of the secrets of success lies in the construction of the border, or perfect drainage. Without free drainage the soil will get sour within a year, and decayed roots and unhealthy trees result. Under these conditions we miss that rich flavor so desirable in perfect fruit. With good drainage it does not matter whether the border is wide or narrow, for the soil will then keep in a sweet, healthy condition for years. There is no need of going to the expense of artificial drainage if the natural drainage is perfect. Natural drainage is, in fact, the best; if there is the least doubt about it, however, do not take any chances, but put in drains. Follow the same plan as described for the Grape border. Of course, it means an initial expense to put in perfect drainage, but

it will save the grower much worry in the years to come, and in the case of a private establishment, where the object is to produce perfect fruit without regard to expense, the owner will certainly get greater satisfaction out of a well built border.

Growing Peaches and Nectarines under glass is not a very expensive luxury. In the first place, they do not require an extremely high temperature, especially with fire heat; the coal bill is therefore not a serious item. Fruit in the late house can be produced with little or no fire heat and then it becomes only a question of labor, which is nothing when compared with the returns and the pleasure derived from the fruit, if it is a success.

In making up a border it should be borne in mind that young trees have a tendency to rank growth for the first year or so; therefore, the border should not be made too rich. Use fertilizers that will not be available for some time, such as coarse or one-half inch bone; the trees will derive benefit from this for years. Potash, also, is necessary for the Peach, though this may be applied as a surface dressing when the trees need it. If a border is made up of sod loam, the trees will make excellent growth for a year or so with little or no fertilizer. At this time it is not necessary to use farmyard manure, but it may be applied as a top dressing when the trees have passed their stage of rankness.

Peach borders should be made on the same principle as that advised for Grapes, but the soil may be somewhat lighter. Let it consist of good, turfy loam, being substantial but not of a clayey, heavy nature. Peaches will thrive for some years in a comparatively shallow border, but with perfect drainage two to two and one-half feet of soil will be more lasting. With too shallow a border the trees are in danger of drying out too often. The trees may be confined wholly to the inside border. Bone constitutes one of the best ingredients for all fruit borders; that known as one-half inch bone is to be preferred. Use, say, at the rate of one part of bone to fifty of soil, which is a good proportion. But soils vary greatly in quality. If the soil is poor, more bone and other fertilizers can be used to good advantage. It is difficult to give the right proportion for the best welfare of the trees, as it all depends on the constitution of the different soils. Hardwood ashes form a valuable ingredient when mixed in about the same proportion as the bone. Good Peaches cannot be produced without the aid of potash in some form. With a poor grade of soil some high grade fertilizer applied near the surface will be of benefit, but I prefer a good loam with less manure. Excellent results can be obtained with Thomson's manure. It is high priced, but a few bags for top dressing will go a long way and it is doubly valuable for being a complete fertilizer.

While the border is the foundation of success in fruit culture under glass, feeding in the years that follow also requires careful thought and good judgment, as I shall explain later. An important point to be mentioned here is that the soil should not be brought in or handled after heavy rains; let it first dry out fairly well. The modern farmer will not handle or plow his land when overcharged with moisture. Similarly, sod for the border should be in a free, workable condition—neither too wet nor yet dust dry. It should be in such a form that the border can be thoroughly firmed down without injury to the soil.

Peach Peregrine

The Peregrine is a distinct mid-season variety and one of the finest forcing Peaches for color, richness of flavor and free cropping

PLANTING

Peach trees may be planted either in the early Spring or in the Fall, though I decidedly prefer the early Fall, or soon after they have cast their foliage. If planted in the early Fall, the young trees will probably make a few new roots, which will be of great benefit to them when they start up in the Spring. For a test you may, in starting your house, plant one half in the early Fall and the other half in Spring. The results will surely lead you to do your further plantings in the Fall. However, if the house is not in shape for planting until December, wait until the turn of the year, for there is no advantage in planting at that late date, as root action would be perfectly dormant then.

Get the very best grade of stock obtainable. In our climate, with its plentiful sunlight, results come quickly, as the trees will make a remarkably luxuriant growth under this treatment. Peaches may be gathered the first season, if required, for by securing a few pot-grown trees, eight to ten ripe fruit may be taken from each tree. Many varieties that I shall recommend must be imported from "the other side," particularly Nectarines. I have found, in my experience of importing these trees, that Peaches and Nectarines grown in pots are far more satisfactory for importing than trees dug out of the nursery. The pot trees will start off unaffected by the 3,000-mile journey. I have never lost an imported pot-grown tree, whereas trees from the nursery did not prove satisfactory. Fruit growers in Europe are beginning to realize this fact and annually grow a large quantity of trees for export. These trees can be trained readily into any shape desired. In ordering it is well to state for what purpose the trees are wanted, whether for training or otherwise. These pot trees will not be trained trees, but will be selected with a view to adjusting them easily to any form desired. If quick results are wanted, it is well to secure the trees in advance. For instance, if a range of fruit-houses is contemplated, the work of building is generally begun in the early Spring, and the number of trees required may be secured at once and trained into form to suit the house. Get nice, thrifty, young pot-grown trees for this purpose, repot them into pots a couple sizes larger than they were grown in and place them in the garden where they will get the full benefit of the sun and be sheltered from the north, if possible. A temporary trellis may be set up for training the young growth to. All this can be done at small expense, and there will be a fine lot of trees to plant in the house in the Fall—better than could be secured from the nurseryman, for the Peach will make considerable growth in one season here, with good care. Trees so treated should yield eighteen Peaches apiece the first season after planting. I have known of Peach trees half grown, which were carefully lifted and transplanted inside, with immediate results. But I am not in favor of such a procedure, for it does not take any great length of time to produce a tree capable of carrying a crop of 150 or 200 fruit, provided it has room to develop. Plant only as many trees as are to grow permanently in the house, for if more are planted with a view to removing the superfluous ones before overcrowding the others, they are frequently left until too late, and the ensuing disfigurement of the remaining trees is not easily remedied.

In planting crosswise of the house, it is better to plant only one tree for each trellis, and have some in pots or tubs in between, if necessary; these can be then shifted when the permanent trees require their space. In this way there will be no danger of overcrowding or damaging the trees which are to occupy their positions for years. If these trees have been grown in pots, reduce the ball somewhat, or enough to loosen out the roots, as this will give them a better chance to take hold of the new soil and grow more freely. Do not plant too deep. It is better to plant a tree a bit high than too low. But try to have them on about the same level along the border as they were growing before. Firm the soil well around the roots, and put a light mulch of manure around to prevent too rapid evaporation after planting. If the planting is done in the Fall and the trees receive one good watering, with a mulch of short farm-yard manure, the soil will keep in a moist, healthy condition all through the

PEACH BELLEGARDE

Bellegarde has stood the test as a forcing Peach for many years and can still be highly recommended. Excellent for shipping purposes

Winter months, and this will be much better for the roots than watering. But this depends on circumstances, as some soils will dry out much more quickly than others. So long as the soil is slightly moist everything will go well, but if the trees are allowed to dry out, there may be serious trouble. Not that they will die, but when root action starts in the Spring, and the blossoms are due to expand, the fruit buds will be drooping instead of swelling away, causing failure and annoyance for the whole season.

Whether the trees are planted crosswise of the house or in any other way, they should get the same care. In a comparatively narrow leanto house plant them along the front wall and train them up the roof on trellis about eighteen inches from the glass. If they are grown crosswise in a narrow structure, they have no room for development. If trained up the roof, they may be planted along the front about six inches from the wall, and at least twelve feet apart; but fifteen feet would be none too much to allow for the proper expansion of the branches on each side. There is nothing to be gained by overcrowding.

In growing Peaches under glass, the same principles apply as when Nature takes care of them, as to how long a tree will remain in a healthy, vigorous condition. Of a dozen trees planted in a house, all receiving the same treatment, some will give out before others, for reasons not easy to explain. Then, again, the Peach borer may get into some with its deadly work, weakening the tree to a certain extent. As soon as a tree shows signs of failing health, whether it be eight, ten or twenty years old, remove it and replace it by a young tree. I have seen excellent fruit gathered from trees that have been planted fifteen or sixteen years. This is a pretty good record for a Peach tree under forced treatment. If we see a tree begin to fail in health, we have a chance to prepare another tree, so that it will yield results at once when planted, whereas in planting a small tree, the space would not be filled up for a year or so.

CULTURAL DIRECTIONS

The eastern States are admirably adapted for the successful growth of the Peach and Nectarine under glass. We can get much quicker results here than in some other climates with less sunlight. While rankness in young trees should not be encouraged, yet if the wood is thoroughly ripened by the Fall, an abundant crop is produced in the following season on wood that it would be impossible to ripen in England or Scotland sufficiently to yield fruit, and with good judgment there should be a continuous crop from year to year.

The great secret of success lies in the management of the house and the treatment of the trees when the heat is first turned on. Do not excite the buds with too much heat, but give them time. The Peach tree does not need much coddling. Fresh air, also, is important. The first aim now is to get strong, healthy blossoms. Though progress may seem slow, it is better for the fruit. After the fruit is set and begins to swell it will make up for lost time. In a house started the 10th or 15th of December the earliest varieties should be ripe about the first week in May. If forced to ripen much before that time, the fruit will be premature. It is a serious mistake to try to force newly planted

NECTARINE SPENCER
One of the largest, highly colored Nectarines; late in ripening

young trees before the turn of the season, or the first of February, for they are not in a condition to withstand early forcing. And it is not worth while to injure them for the small amount of fruit that may be gathered from them the first season.

There is an old saying that "cleanliness is next to godliness." A fruithouse thoroughly cleaned before starting will save much worry and annoyance during the growing season, for it is then impossible to use insecticides or fumigations strong enough to eradicate evils like the San Jose scale or mealy bug. But if the work is done while the trees are dormant, it may be easily accomplished either by washing the trees or by fumigatiom. If there are any indications of San Jose scale, fumigate with hydrocyanic acid gas, which is the only sure means of eradicating them. This gas will also clear out all other insect pests. The method of using this gas will be described in the chapter on insect pests.

When you are sure that the house is clean, remove all the loose soil and give the border a light fork-over, being careful not to destroy any roots. Then apply a top dressing of a couple of inches of rich soil, or half soil and half rich farmyard manure, with a good sprinkling of bone. The richness of the top dressing will depend on the condition of the trees. If they have a tendency to weakness, let the dressing be light. As a general rule, however, when the trees are well established and are carrying heavy crops of fruit, and depend wholly on the inside border, considerable feeding is necessary through the season. Thomson's manure can be used a couple of times during the season to good advantage, at the rate of half a bag (56 pounds) to a house or border 45 x 25 feet. The first application may be made soon after the house is started. Mix the manure with four or five parts of soil and distribute evenly over the border. In every case after applying Thomson's manure, water in lightly. A good time

to use this manure is a few days after the border has received a thorough watering. When a border has been for some months, as during the winter, without water, it is surprising what a quantity of water is needed to thoroughly saturate the soil, which should be soaked through from top to bottom.

Another light dressing of Thomson's manure may be applied when the Peaches are half grown. Take a little over half the quantity given for the first dressing. It is not necessary to depend wholly on one manure. In fact, a couple of waterings during the season with manure water from the farmyard is very beneficial, provided it is not used too strong.

This question of feeding is an all-important one. The skillful cultivator is able to judge when to give food, and the kind of food best suited to the welfare of his crop. While plants cannot talk, yet their needs may be observed by studying the foliage, through which plant life finds its best expression. From its appearance the grower will know when to feed and when to refrain. In a plant that has been fed to the limit, the foliage has substance, with the different veins standing out prominently. If the foliage feels brittle to the touch, the plant has been overfed, and it should receive no further nourishment for a time; otherwise, damage may be done. This applies both to fruit and flowers. An interesting and instructive book might be written on the advantages and disadvantages of feeding. Many a promising crop has been practically ruined through overfeeding. To be successful, every grower should study this question thoroughly, for experience is the best guide in the end.

NECTARINE ADVANCE

A second-early Nectarine of rich flavor. Not so highly colored as some varieties, but worthy of a place in the forcing house

Hardwood ashes are also excellent for Peach trees. Potash is desirable for the health of the trees, aside from being good for the fruit.

The Peach tree, as I have stated, does not want strong heat when first starting. While the temperatures that I shall mention may seem low, still I have used this method for many years with good success. I am referring here to early forcing, or to a house started about the middle of December. For the first week or ten days keep a temperature of 40° by night and 50° to 55° by day, then 45° by night, with a corresponding increase by day. As the buds begin to swell, increase to 50° by night and 60° to 65° by day, or 70° with sun heat. Always admit a crack of air when the thermometer registers 5° above the night temperature. The trees will be in full bloom about the end of January or the first of February, and if brought along in the low temperatures above recommended, the blossoms will be strong, with good pollen—conditions very desirable for securing a good set. Gradually increase the temperature from now on, until a night temperature of 60° is reached, with 70° to 75° by day. Maintain a fairly dry, bracing air while the trees are in bloom, for it is necessary to have the pollen dry around mid-day. The early peach-house must be hand-fertilized, for at this early period of the year there are no bees around to perform the work. The blossoms should be gone over about mid-day, either with a camel's hair brush, or, better still, with a rabbit's tail tied to a stick, which will distribute the pollen admirably.

After the fruit is set, spray every clear day, morning and afternoon. From now on the trees and fruit will make rapid headway and can stand more heat if it is brought along slowly at first. Here we gain on the time apparently lost earlier.

Airing is an important factor. Both the Peach and the Nectarine want plenty of fresh air. It should not, however, be admitted in a haphazard way. When the thermometer rises about 5° above the night temperature a crack of air may be admitted to good advantage, and gradually increase as the temperature goes up steadily. Do not admit the air to the extent of lowering the temperature or causing a sudden drop, but let the temperature rise gradually and also decrease it in the same way. Try to avoid erratic changes. Carelessness along these lines will undo good work, especially through the Winter and the early Spring months.

Careful watering, also, is needed now. While this crop should never suffer for want of moisture at the roots, yet too much water is as bad as a shortage. The best way is to give a thorough soaking and then no more until it is necessary. Arrange the watering period, if possible, so that the tree will not require water while the fruit is ripening. This may seem a small matter, but it is an important one. For if a quantity of water is dashed around the roots just as the fruit is ripening, its flavor will not be improved; nor will it be benefited, on the other hand, if the tree is allowed to get too dry. Try to strike the happy medium, and this can be done with a little forethought.

The above directions for the early house apply practically also to the later houses; but these do not require the same close attention as to airing, for it is not necessary to use fire heat after the first week in May. After the fire heat

is dispensed with, leave a crack of air on all the time. In airing be careful not to make any sudden changes of temperature. Squalls frequently come up during the Summer months, when the air may be reduced to good advantage.

In growing Peaches and Nectarines for private use, it is important that the supply should be kept up as long as possible. With care in selecting the varieties, fruit may be had from the first week in May to the first week in October. For a steady supply three houses are absolutely necessary, and of these the early house is started the middle of December, the second house on the first of February, and the late house about the 10th of March. It is impossible to hold the late trees much longer; in fact, to hold them to that date they must be kept as cool as possible, with open ventilators and doors. But it is not safe to hold them back after they begin to move or the buds commence to develop, otherwise there would be danger of a check.

DISBUDDING AND TYING THE YOUNG GROWTHS

Peaches and Nectarines under glass must not be overcrowded; otherwise, the wood cannot develop properly. This is an important matter, as the success of the following season depends on the treatment of the young wood. Fruit trees brought along in a crowded, cramped condition cannot develop good buds; these are the prerequisites of good foliage, and require sunlight, with space for the foliage to expand. One good fruiting shoot is worth two poor ones; therefore, disbudding is an important factor in the work of obtaining good fruit. The man in charge of this work must be thoroughly familiar with it, for much depends on the way in which the operation is carried out. Always try to maintain a well-balanced tree. Generally some branches will grow stronger than others, and this tendency may be overcome somewhat with good judgment in disbudding. If all the shoots were allowed to remain, we should soon have a "conglomeration of nothing." Disbudding consists in the removal of all the surplus shoots. It should be done by degrees. It would be a serious mistake to remove them all at one time, for this would give a check to the tree not easily remedied. Young trees as a rule do not need the same severe disbudding as old, established trees. With full-grown trees much of the wood that bears the fruit is cut away after the crop is gathered, and it is well to secure a good shoot at the base of the previous year's growth to take its place. This disbudding should be begun while the shoots are quite young, or about half an inch long. Remove some of the thickest clusters at first, and repeat the operation every other day until the work has been accomplished. Where there is fruit and the shoot is not needed, pinch at the third leaf instead of removing the shoot, for the remaining foliage is necessary for the development of the fruit.

By this method of pinching, fruit buds will form during the Summer, or toward the Fall, and fruit buds formed on those spurs generally produce excellent Peaches the following season. Some branches grow stronger than others, and if permanent shoots for the next season's fruiting wood are selected from the top side of the extra strong shoots, they will also naturally grow strong. As sap flows more freely from the highest point, I would recommend selecting

the shoots on the lowest part of the strong shoots, and, conversely, on the highest part of the weaker shoots. With careful manipulation the sap may be caused to flow evenly and produce a well-balanced tree. Aside from its appearance, more fruit can be grown on an evenly-balanced tree than on a lop-sided one.

Pinching and disbudding require deep thought, and must be done by a man with good judgment, who loves his calling. A tree that has been properly pinched and disbudded, with all the old and useless wood removed after the fruit is gathered, will need very little Winter pruning. If all the useless wood is pruned away directly after the fruit is gathered, it relieves the tree of that surplus burden, to the decided advantage of the remaining wood. The sap can then run through those branches on which the success of the following season depends.

The main object in pinching and disbudding is to leave enough shoots to furnish the tree for the following season. Much of the success one year depends on what has been done or left undone the year previous. Therefore, enough young shoots should remain on the tree, so that when tied into shape the young wood is about five inches apart, with plenty of room for development. It is easy to ascertain when the old wood must be cut away, after the fruit is gathered. The terminal shoot may be pinched at the fourth or fifth leaf, thus allowing more space for the young wood, with no damage to the other. The ideal tree will be furnished equally all around, from top to bottom, and this can be brought about by carefully regulating the flow of the sap. The best way to do this is to be cautious in the selection of the shoots. Many will have to be pinched, instead of being rubbed off, on account of the fruit. This, however, is no detriment, but rather an advantage, as it gives room for the formation of spurs here and there over the tree.

After the operation of disbudding comes that of tying the shoots loosely to the trellis. This need not be done until they have made a growth of a foot or more, but before the wood gets set or stubborn. It is not at all necessary to pinch or stop those shoots; rather allow them to make their full season's growth. But any shoot that becomes unusually rank, as often happens even in the most skilled hands, should be cut away entirely.

A tree that is making a satisfactory growth needs tying at intervals during the season. If the shoots are found to be crowding one another, one may be stopped here and there, but this depends on circumstances. The general principle is, to allow the shoot to make the season's growth unchecked. In our climate there will always be a plentiful supply of fruit buds for each succeeding season, if the wood has adequate space for development; but when too much wood is crowded in, we get blind wood, or at least more wood buds than fruit buds. These two can be readily told apart. Nor can a multitude of fruit be obtained from unripened wood, for then the blossoms probably will be weak and liable to drop before the fruit sets.

CHAPTER XVI

THINNING THE FRUIT—GATHERING THE PEACHES AND NECTARINES WHEN RIPE

Treatment of Trees after Fruit is Gathered—Pruning and Training

BOTH the Peach and the Nectarine usually set heavy crops, and if all the fruit were allowed on the trees, they would, within a few years, get exhausted with overcropping. It is, moreover, impossible to have fancy fruit when the tree is overloaded. Fruit from an overcropped tree lacks that sweet, delicious flavor which is so much appreciated in fruit grown under glass. This is one of the most important points in this kind of fruit culture. While severe thinning may seem a waste of fruit, we gain in size and quality what we lose in quantity. A fair crop, furthermore, means a steady supply from year to year. There are, in fact, no off years with fruit under glass, with proper treatment.

A grower should become familiar with the different varieties before undertaking to thin his crop, for some kinds grow much larger than others. A Thomas Rivers Peach will require more thinning than a Grosse Mignonne. Noblesse Peach, when fairly well thinned, is one of the finest for indoor work, but overcrop it and its flavor is flat. The same applies to Nectarines, though they may be left on the tree a trifle thicker than Peaches. The improved form of this fruit that has appeared in recent years is larger than the Nectarine of years ago. Victoria Nectarine, when not overcropped, is magnificent, both in size and flavor. Unfortunately, it is somewhat deficient in color, but the flavor, which should count more than the color, is all that could be desired. No rules can be given as to the quantity of fruit a tree can carry, for it depends on circumstances—whether a tree has a tendency to rankness or is of normal growth. The first may be allowed to carry more fruit, for it will be beneficial rather than hurtful.

In the house twenty-five feet wide, with the trees planted crosswise, one tree for each trellis planted in the center of the house, there will be a spread of branches on each side of the main stem of about nine feet, or a complete spread of seventeen or eighteen feet, a trellis, say eighteen feet wide and ten feet or more in height. A full-grown Peach tree will cover the allotted space on the trellis, and it should carry annually from 250 to 300 fruits, according to the variety and size, if it is in a healthy, normal condition; this is a safe, conservative estimate.

Some writers on the subject recommend leaving much more fruit than is necessary until the trees have passed their stoning period and are commencing their last swelling. The stoning period is the critical time; occasionally the fruit will not, for some unknown reason, stone properly, and the kernel will die. Hence the advice to leave on a surplus lot of fruit until they start their second swelling, when the danger is past. But I do not recommend leaving on many surplus fruits for such an emergency, for when the Peach is once stoned, the bulk of the work is practically done as regards the strain on the tree. If the forcing process is brought on gradually, with strong blossoms, which means abundance of pollen, a perfect set will follow, and there is not much danger of the fruit dropping while stoning.

Peach Bellegarde

The time for beginning to thin depends on circumstances. Under favorable conditions nearly every blossom will set. In case of a very heavy set, a quantity may be removed when about the size of peas. Remove the majority from the north side, where trees are planted crosswise of the house, and the house runs north and south. The second thinning may be done when they are about the size of hazelnuts. Always try to have as many of the fruit as possible face the south side, and have the crop divided equally all over. This is better for the welfare of the tree aside from the appearance Peaches that are allowed to mature on the spur wood usually turn out magnificent fruit.

In thinning fruit down to normal crops, it is better to repeat the operation three or four times, than to be too severe at one time. Do the final thinning when they are about the size of walnuts. This will give one a better line on them. The process of thinning is a deceptive one. I have often thinned down to what I thought would leave about 300 fruits on each tree, only to find later that I had left at least 500. It is not a bad plan, therefore, to get a line on the tree when they are gone over for the final thinning. When the fruit takes on its last swelling, after stoning, and begins to color, every single fruit will show up, and I have been often astonished to find that I have been far off in my estimation. I now make it a practice to count one tree roughly, as a guide to the others, and I thus come pretty near to the mark. The question of proper thinning is one of the most serious which the cultivator has to face. Although the work itself is not difficult, it takes a man of nerve to thin down to the required number. Many a time, when I have gone over the trees for the last thinning, and have pulled off some thrifty looking specimens, so as to bring down my crop to a fair average, I have felt guilty of waste. But we must remember that in producing fruit under glass we are striving for the highest perfection, and this cannot be attained if the trees are overcropped.

But we must not go to the other extreme, for if a tree is given too light a load, it may develop a tendency to rankness, and this is not desirable for a healthy tree. Keep to the golden rule, and this depends on conditions. Our climate is ideal for Peach culture under glass, and what we call an average crop would be heavy in a less favorable climate. If a tree produces 250 to 300 handsome fruits year after year it should satisfy the grower.

The subject of gathering the fruit may seem superfluous to discuss, as any one can tell when the fruit is ripe. While this may be true, yet one must know the exact moment of maturity. If a Peach is pulled off too ripe, it loses some of its flavor, and it is also lacking in flavor if pulled too green. The fruit should be gathered as soon as possible after it is ready. Sometimes it will be highly colored where the sun strikes it, long before it is ripe. In such a case the fruit will give warning a few days before it is ready by the rich aroma which it exhales; we must then keep close watch so that it may not get overripe and drop.

This fruit when ripe is very easily bruised and disfigured, and should therefore be handled with great care. It is an almost unpardonable offense to set disfigured hothouse Peaches and Nectarines on the dinner table. The best way to gather this fruit is by hand. Take the Peach in the hollow of the hand, holding the fingers as nearly as possible behind the fruit; if perfectly ripe, gentle pressure will release it from the tree, and it may be removed without the slightest mark or blemish. Testing by the finger-and-thumb method is a very reprehensible habit as it invariably produces blemishes on ripe fruit. In extremely hot weather the trees may be gone over in the morning and afternoon and the ripe fruit gathered. It is not necessary to handle them much. If the fruit changes color around the stem, this is usually a signal to get busy. It is a mistake to hold Peaches in the ice box for any length of time. While they may be kept for about a week in this way, they lose their brisk flavor.

TREATMENT OF TREES AFTER FRUIT IS GATHERED

Success or failure depends to a great extent on the treatment which the trees receive after the fruit is gathered. The fruithouse is naturally more interesting while the fruit is developing. But we should remember that the fruit buds will continue to develop as long as the foliage remains on the trees, and if we neglect those buds at this stage there will be a serious setback for the following season's crop. Not that a great amount of time and labor need be put on the trees. Leave on all the air possible from this time on, except in case of wind storms or heavy rains, when the ventilators should be lowered enough to shed the water or to guard against the gusts of wind.

During three hot months following the gathering of the crop in May and June there will be rapid evaporation, with full ventilation both top and bottom. Then the border will occasionally dry out quickly. While the trees should not be saturated at this time, yet they should not suffer for want of moisture at their roots so long as they are carrying their green foliage. When watering give a thorough soaking, otherwise there may be a moist surface with a dry bottom. This is a condition very unfavorable for the health and vigor of the fruit trees, and is one of the chief causes of the dropping of the buds in the following Spring. Perfectly developed buds will not drop to any extent, unless they are unreasonably rushed along with artificial heat when they are started up early in the season. However, too much water is as bad as not enough; for with an inside border an over-supply of water will cause souring of the soil, especially after the trees have made the bulk of their growth. I emphasize the danger of neglect at this period of the tree's life, for if a tree does not get the proper treatment now, it will not do its best work in the season to follow.

Toward the Fall, when the trees have completed their growth and the wood is fairly well ripened, less water is required. The border is now apt to crack; this may be prevented by keeping the surface raked over, or a light mulch may be applied, as a cracked border tends to break the fine working roots, which are the most essential for the tree.

Spraying the foliage is also important at this time, otherwise red spider will make rapid headway. The trees can be sprayed to good advantage twice a day, in the morning and at night. Bear in mind that with indoor fruit the trees are depending wholly on you for their sustenance, especially when there is only an inside border. This border is all right, particularly for forcing, but the supply of moisture at the roots calls for close attention. With old established trees, which are matted with roots, it is occasionally difficult to get the water to soak in thoroughly around the base. In this case it is best to turn on the hose, letting the water run very slowly for about an hour, or until you are satisfied that it has penetrated through. This slow process of watering is effective on any dry spot, and does not call for constant watching of the hose.

When a heavy crop has been taken from the trees, a light feed will be of benefit. But this depends on the condition of the trees. If they are unusually vigorous, it may hurt them; but trees that have no tendency to rankness, with the border full of roots, may be fed once or twice to good advantage. A light

NECTARINE EARLY RIVERS

This is one of our largest Nectarines and is remarkable for its handsome appearance. It is also an early sort, ripening two or three weeks before Lord Napier

dressing of wood-ashes on the surface, applied when they are in need of water and then watered in, is very good for the development of the fruit buds. A surprising amount of feeding can be done when the trees are well established and in full health and vigor. Heavy feeding at one time is dangerous, for it is liable to burn the roots, and this does more harm than good. It is much safer to feed lightly and often.

A certain amount of potash is excellent for this crop, both when the trees are carrying the fruit and when finishing up their wood for the following season. Potash applied in the form of hardwood ashes is as good as any other. I have used it successfully for many years. Some soils will take more than others. Study your soil and apply the ashes accordingly.

The foremost authorities on fruit culture are agreed that the following elements are necessary for the maintenance of thrifty, healthy, vigorous trees for any length of time: Phosphoric acid, potash, lime and nitrogen. These may be applied separately or in the form of a complete fertilizer. The inexperienced grower will find it easier to use a complete manure, for all the high grade manures give full directions as to how much to apply in order to get the best results. For light feeding after the crop is gathered phosphoric acid and potash are the best, as they will firm up the wood and develop the buds. I attribute whatever success I may have had during many years of handling Peaches and Nectarines under glass to the carrying out of those simple rules.

If any hardwood plant is forced while the buds are not fully developed, or the wood is not well ripened, the result is far from satisfactory, even if the plant gets the best of care. The same applies to fruit under glass. Give your trees good treatment along these lines, and you will be more than repaid the following season.

I do not believe in tying the shoots much after the crop is off; better let them hang a bit loose. If every shoot is tied in place the house will present a much neater appearance; but as our object is to produce high class fruit, we should give trees the amount of liberty which agrees best with them. Trees may occasionally make a few sappy growths toward the Fall; these should be cut away before they take much strength from the other shoots. Much may be said as to the treatment of the trees after the fruit is gathered. I trust that I have demonstrated the importance of proper treatment, for it means healthy trees, and healthy trees mean an abundance of high grade fruit, which is the aim of every grower.

PRUNING AND TRAINING

The Peach tree requires both Winter and Summer pruning. If disbudding and the cutting away of useless wood have received proper attention during the growing season of the trees, not much Winter pruning will be necessary. The grower should be thoroughly familiar with the mode of bearing and should, above all, be able to distinguish the wood bud from the fruit bud. Occasionally, especially when the trees get older, there will be quite a space toward the terminal ends of the shoots where there will be more fruit buds than wood buds.

It is easy to tell the one from the other: the wood bud is more pointed and conical, while the fruit bud is almost round and also larger. As the fruit buds will always predominate, especially when the wood has been properly ripened, we can tell, in the case of the Peach tree at the end of the growing season, what the prospects will be for the following season. If the buds stand out prominently we may rest assured that any failure will be our own fault. Judgment should be used in any pruning that is done, as so much depends on the thrift and vigor of the tree.

The object of pruning is to furnish space for tying in the young wood, as we are chiefly depending on this for the next season's work, unless the trees are supplied with some spur wood, of which there should be the proper amount, if Summer pinching has been done.

Winter pruning may be commenced any time after the leaves are off, for then the buds are fully developed. Or it may be done any time between the falling of the foliage and the rising of the sap. Before beginning to prune, all the young wood should be cut loose from the trellis, leaving only the main branches tied to keep the shape of the tree, as a gauge for pruning. Always try to have a well-balanced tree. If a tree is inclined to be a little more vigorous on one side than on the other, prune the heavy side a little more severely. Here we see the advantage of having a house running north and south, for in such a location there is little or no difficulty in preserving an evenly-balanced tree. The sun will shine on both sides some part of the day and this is a great help toward regulating the sap.

A tree will sometimes make quite a growth during the Summer, and the shoots may be benefited by some shortening back. In this case be careful to prune to a wood bud, for if you prune to a fruit bud, the wood will eventually die back, and as there will be no foliage, there will be no sap beyond the wood bud. This shows how absolutely necessary it is to be familiar with the two kinds of buds. Some varieties of Peaches are more shy than others in producing wood buds, especially toward the terminal ends, but when a shoot is to be shortened back, it must be cut at the wood bud.

Peach trees, like most other kinds of fruit trees, may be trained into almost any desired shape. The fan shape is the best and simplest. When planting a young tree, do not allow the growths to progress unchecked, or the tree will soon reach the top of the trellis at the expense of the lower branches. Prune back any strong growing shoots, so that the bottom of the trellis will be furnished before the top. If these strong growths are not checked they will make an ungainly tree within a few years; and it will then be too late to restrain it. The easiest and the only proper time to balance the tree is when it is young. Do not plant trees in a position where it would be impossible to carry the same amount of foliage on one side as on the other. This may seem exact to the extreme, yet it is a highly important point, and there is no argument which can be advanced against it. Plant a tree where Nature will care for it. That tree will have about equal foliage on both sides if it has proper space for development. Bear in mind this lesson from Nature when planting Peaches under glass. Though Peaches have been planted in years gone by in positions where there

was not space sufficient for their full development, and fair results have been obtained, this is no argument for scrimping the tree as to space. Provide a roomy house for your trees, so that each and every one may have an equal chance, and they will more than repay you for your liberality.

Pruning may be viewed under three different aspects. In the first place, all the very weakest wood should be removed. Then, if necessary, shorten back the wood intended for the following season's fruiting, if it is overcrowded. When the fruiting shoots are more than eighteen inches long, they are improved by shortening back some; this will make the growth become more uniform. For instance, if a growth of two feet or more has been made in one season, shortening this back to eighteen inches will cause the shoot to break more regularly and also stronger. This refers to medium growths. A tree planted eight or ten years will throw shorter wood, sometimes not over a foot long; this should not be shortened back.

A tree that has been pruned so that the fruiting wood, when arranged and tied in all over, is five to six inches apart, is about right. This refers to full-grown trees. Give the trees the proper care in the matter of disbudding. Then in due time select a shoot at the base, and train this during the Summer. Remove the shoots that have borne fruit as soon as the crop is gathered, except those that are needed to balance the tree evenly. The process is a simple one when understood, and an interesting one from start to finish. Be sure to guard against the overcrowding of branches and foliage.

Next after pruning comes the operation of tying the shoots into place. If the tree has been properly attended to, there will be sufficient branches to spread evenly all over the trellis or frame work. Distribute and tie all the main branches first, then tie in the fruiting wood, starting at the bottom of the tree and working up. The strongest shoots may be secured with soft string and the smaller ones with raffia; do not tie the latter tight, but allow for the growth of the Summer months. Peach trees when pruned and tied evenly all over the trellis look very neat.

The young tree's tendency to rank growth may be modified to some extent by allowing a fairly heavy crop of fruit during the first three or four years. If this will not check the exuberance, then root pruning must be resorted to. This consists in shortening back the strongest roots, or digging a trench around the tree three or four feet from the base, according to size. If the strong growing roots are thus checked, there will be a much firmer and more moderate growth. Root pruning will also cause the tree to produce more fibrous roots, and these are the most desirable for the fruit-bearing wood. When the trench has been dug around the tree, cut the roots with a sharp knife, making a clean cut which will heal quickly. All Peach pruning, by the way, should be done with a knife.

The effects of root pruning will become apparent the following season. The reduction of nourishment will induce less rapid development. Judgment, however, must be used in this work. Do not root-prune too severely, as it will have a bad effect on the tree for a year at least. While the fruit buds would no doubt be plentiful under the close root-pruning process, the fruit would be smaller in size.

The best time for root-pruning Peaches and Nectarines is after they have completed their season's growth, or at least a week or so before they drop their foliage in the Fall. Different writers have recommended different periods of the year, but the early Fall is the most appropriate time. The wood is then pretty well firmed up, the extreme heat is over, and finally, it allows time for the trees to adjust themselves and for the cuts to callus, and root action will begin after the turn of the year.

In growing these trees under artificial treatment much better results will be obtained if they make a fair, moderate growth; but young trees will grow rank, especially if the border has been made over rich, and in such a case root-pruning is the best means of bringing the tree around to normal growth. Usually a tree may be brought into good shape by a little heavier cropping if it is growing too strong. The fruiting wood on full grown trees should be shortened back to about eighteen inches, according to circumstances. With a strong growing young tree the object is to cover the trellis as soon as possible, if it can be done without damage to the shape; here the wood may be left considerably over eighteen inches; indeed, it is of advantage to have two or three feet of young growth if the shoots are strong, and with the rapid growth that they make it is possible to ripen fairly strong wood to produce fruit the following season.

NECTARINE NEWTON

Newton Nectarine will be found excellent as a midseason variety, handsome in appearance, with a rich Stanwick flavor

CHAPTER XVII

DISEASES AND INSECT PESTS THAT AFFECT PEACHES AND NECTARINES

THE successful grower of indoor fruit must wage an incessant fight against insect pests and diseases. These affect both the Peach and Nectarine more or less, and if not checked will spread more rapidly than on trees grown in the open field or garden. This is especially the case with San José scale. The extra heat and humidity of the house favor the rapid increase of this noxious pest. When I was working for some years in a district where San José scale was very prevalent on all outside fruit trees and shrubs, I decided to import all my Peaches and Nectarines, with the view to having clean stock. But my precaution was useless, for while I got my trees in good condition, San José scale appeared within a year, although I did not come into close contact with the scale outside, the infected trees being some distance away. It seems, therefore, that small birds and bees, and especially the bumble bee with its hairlike feet, are the means of carrying and spreading this pest. The scale, when just hatched, is as fine as dust. At that time hydrocyanic acid gas was little known, and the only means we had of keeping the pest in check was lime, sulphur and salt. This formula was troublesome to use in a close structure, with white paint to protect, but it was fairly successful. We discarded it later in favor of hydrocyanic acid gas.

It was different with the Peach borer, however, for while we used the lime-sulphur formula about four years and succeeded in keeping the borer down, when we discarded this for the gas, the borer appeared again in numbers. I have found in my long experience with different insecticides and fungicides, that we may learn something from all of them.

Insect pests, if allowed full sway, will very soon weaken the constitution of even the most healthy and vigorous of trees. During the Winter months, or while the temperature is low, they hibernate in their burrows under the bark, reappearing and beginning their work of destruction when the warm weather comes or the heat is turned on. Larvae of various sizes may be found on the trees at almost any time, ranging from very small ones to those that are nearly full grown. The period of preparation and emerging of the moth being extended, there will be different crops during the season. The borer turns into a cocoon and comes to the surface just before the fly emerges from the same. With close attention the borer may be gathered up before the fly leaves its cage. It

PEACH THOMAS RIVERS

Thomas Rivers Peach is one of the largest. It is particularly handsome and a very free cropper, but not quite so rich in flavor as one would wish

is wonderful to observe how Nature will guard her creatures against detection, for the cocoon is of very nearly the same color as the soil, and therefore not easily seen. These wasp-like insects mate soon after their emergence, and the female commences at once to deposit her eggs indiscriminately on the trunk or in the crevices of the bark. The moths may be seen flying around during the day, but it is almost impossible to catch them owing to their agility. The female is somewhat larger than the male. It is also nearly impossible to detect the eggs. They will hatch in about ten days from the time they are deposited. The young larvae at once make their way into the crevices of the bark, and, if not disturbed, will eventually bore into the trees, keeping up their destructive operations until the cold weather sets in again. As a preventive the trees may be painted around the base or trunk with a mixture of lime and sulphur with a little salt; this last named ingredient will cause the other two to adhere more firmly to the stem or the trunk. Take one and one-half pounds of lime to one pound of sulphur, with one-third pound of salt. This is about the same proportion as the lime and sulphur formula. The amount given here will be enough to make four gallons of wash. Slake the lime in a vessel containing hot water, about one-third of the total required. Add the sulphur while the lime is slaking; it will mix easier if it has been previously made into a thick paste. Add the salt last. This may be allowed to cook over a slow fire for a time, stirring once in a while. Then add enough water to the mixture to make about four gallons. While I do not say that this is a sure cure for the borer, it will act as a preventive and check its spreading. It may be applied with a spray pump or or brush; the former will reach the crevices better. The operation is a simple one, takes little time, and positively does not injure the trees.

San José scale was brought east from California about twenty-five years ago, and ten years ago it began to spread so rapidly that it almost seemed as if the fruit trees were doomed. My first experience with it dates back about fourteen years. I had at that time some Peaches and Nectarines in tubs, and as the pest was new to me, it got beyond my control, with the result that the trees were chopped down and burned. This was not a bad thing to do at the time, as I did not know how to fight them, and they seemed to thrive on the ordinary remedies. But, thanks to the valuable information given out by our Experiment Stations, especially in connection with indoor fruit. this pest now causes us little worry.

The scale must be fought when it is first detected. If the trees are allowed to become infested, the scale will play havoc with the bark, causing it to appear dried up, and it will suck the life out of the trees. Hydrocyanic acid gas will easily keep the scale down. This fumigation must be done while the trees are perfectly dormant. The Peach and Nectarine will stand a considerable amount of gas when the buds are dormant, with seemingly no injury to the buds. They may be kept fairly free from scale by light fumigation every year. It calls for very little work. Be careful to stop up all crevices, for if the gas escapes into an adjoining house, it may do damage to a growing crop. I have used ten ounces of cyanide of potassium fused 50 per cent. for every 1000 cubic feet of space, with no apparent injury to the trees. But I prefer to use the gas before the

scale makes any headway, taking about seven ounces for every 1000 cubic feet, fused 50 per cent. For every pound of cyanide take one quart of sulphuric acid and two quarts of water. Use earthenware receptacles. First place the water in the jar, according to the amount of acid that is to go in. Then pour in the sulphuric acid, and finally the cyanide. This completes the operation. For a house fifty feet long prepare three vessels, as the fumigation is so much stronger than for growing stock. Do not remain in the house after dropping in the cyanide; get out at once and close the door tight. Bear in mind that the combination in the jars develops a deadly gas, which is not to be handled carelessly; but with proper precaution there is no danger. Leave the house closed up for one hour, and then throw open the ventilators. This fumigation will free the house from all insect pests, even mealy bug. The United States Department of Agriculture publishes a pamphlet on this method of fumigation, which gives explicit directions as to the precautions to be taken. This has had several years' test and the results are quite satisfactory.

Green fly is occasionally troublesome in the peach-house, especially during the period when the fruit is setting. This is precisely the time when the grower is handicapped in fighting it, for he cannot spray until the fruit is set, nor can he fumigate. Green fly will play havoc with the young foliage. The foliage will curl up, turn yellow and lose its vitality if the fly is allowed to remain on it for any length of time.

When the fruit is set, the fly may be cleared out very quickly, for the trees can again be sprayed both in the morning and the afternoon; this will check the fly's progress. Spray also every ten days with a solution of whale oil soap, using just enough soap to color the water. This is a preventive against green fly, red spider or any other insect pest, and it will give the foliage a glossy, healthy appearance. First dissolve the soap in hot water, and then pour enough into the water intended for spraying the trees to soften it, but no more. I believe that this treatment is of benefit to the foliage, aside from destroying insects, for after a couple of applications the foliage will look as if it were polished. Good, clean, healthy foliage is the first requisite for perfect fruit; the latter, indeed, cannot be finished satisfactorily unless the foliage is in perfect shape.

I have never found mildew troublesome in the peach-house, when proper attention is given to the airing. Air the house freely; too much coddling will invite all kinds of diseases. With good management, there are not many fungicides to fight under glass. But there is one disease, generally the most noticeable, which needs close watching, namely, fruit rot or blight. It appears in the latter part of Summer, usually after a spell of very close, muggy weather. The best remedy for this is to keep the house a bit drier, gather immediately any fruit that begins to decay, and destroy it, otherwise this fungous disease will spread rapidly. It will be found on examination that the decayed part of the fruit is full of diseased spores; these will spread if left to remain on the tree, and will affect the young wood next to the diseased Peach, occasionally killing it. If the disease is allowed to go unchecked, it will cause serious trouble and the destruction will be rapid. As a precaution against this disease, whether it appears or not, keep the atmosphere a bit dry. There is no danger of trouble

until the fruit is just beginning to ripen. I have never been troubled with this fungus while using artificial heat, which is good proof of the beneficial effect of a congenial, bracing atmosphere. All fungous diseases require certain conditions for their development or spreading. As I have said, we have practically the means in our hands for creating the ideal conditions for the best welfare of the trees and fruit. We have no storms to fight, and when a sudden change in temperature occurs, the ventilators may be closed down. Thus, by using our judgment in providing for the needs of our trees, we can keep them free of any of these diseases. It is better to look ahead and prepare for the enemy than to try and fight him after he has come.

PEACH NOBLESSE

To anyone not acquainted with the admirable qualities of the Noblesse Peach, its appearance would be deceiving, as the variety is a little deficient in color. The flavor, however, is rich and juicy. It is an excellent midseason Peach for forcing purposes

CHAPTER XVIII

SELECTION OF VARIETIES FOR FORCING PURPOSES

THERE are enough varieties at command, both of Peaches and Nectarines, for forcing purposes, to satisfy even the most exacting. It is a truly wonderful collection, including both European and American varieties, with new and improved kinds appearing from time to time. This makes the work doubly interesting and alluring. But we must keep in close touch with the fruit, as experience only will teach us how to judge of the quality of the many varieties at our disposal. This applies especially to the grower for private use, for here it is not a question of a large crop at one time, but one of a continuous supply over an extended period. Different varieties should therefore be planted in a house, so that one kind will succeed another without interruption. As I have already stated, it is possible, with the proper facilities at command, and careful selection of varieties, to have a continuous supply, either of Peaches or of Nectarines, from the first week in May to the first week in October.

My experience of the kinds that I recommend extends over the last twenty years, and I therefore feel sure of my ground. Every up-to-date fruit grower should take note of the different varieties, their time of ripening, etc., and compare his data at the end of the season. Aside from its interest, this plan is educational, and of great benefit for future reference. The memory may be trusted to a certain extent, but the notebook is often more faithful. I recommend the notebook habit especially to the younger generation of gardeners, for they will find well-kept notes an invaluable friend in the years to come. What we learn by our own experience makes the deepest and most lasting impression.

The improvement that has been made in recent years seems marvelous to anyone familiar with the list of forcing fruit thirty years ago. At that date there was some excellent material, more especially of Peaches than of Nectarines. Of the latter we had Hunt's Tawny, Balgowan, Imperatrice, Violette Grosse, Red Roman and a few others. But these have been relegated to the back shelf in favor of the more recent introductions.

The late Thomas Rivers of Sawbridgeworth, England, made it his life study to improve the different varieties of fruit. His success is known far and wide, and he has left a monument to his name that will stand for generations to come. Apples, Pears, Plums, Peaches, and Nectarines, and his early Rivers Cherry *par excellence*, have all been enriched to a wonderful degree by his skillful work. Thomas Rivers did more for the improvement of fruit intended for forcing pur-

poses than any other man. It was my good fortune to meet this leader in fruit culture some years ago while on a visit to his interesting nursery. His lively discussion of his various experiments is still fresh in my mind. I remember, particularly, his pointing out to me his first Peach tree grown in a pot, which, I think, was at that time 36 years old, and was still in a good state of preservation. It was the pride of his collection, the honored tree in his nursery.

In taking up the selection of varieties for forcing purposes, which is as important as the cultural directions, I shall first give a list for early, midseason and late houses, for this division is necessary if an extended season is the object. I could have made my list considerably longer, but it will be found to cover the ground thoroughly, while a more extensive list would complicate matters for the grower not in close touch with the merits of each.

The European varieties should be relied on principally for indoor work, although any one preferring a yellow-fleshed Peach will find Foster Peach admirably adapted as a forcing kind, finishing up with intense color and above the average in size. Crawford's Late will also produce handsome specimens under glass. Generally the white-fleshed fruit is preferable for table use, but a tree or two of the yellow-fleshed varieties should be included in the house, for with their high color they make an imposing, massive showing on the table. If they combine extra large size with this color, they will get the place of honor and be the most admired. I have gathered fine specimens of Mountain Rose, which is white-fleshed and fine in flavor.

I have found that in the midseason house, which is started considerably later than the early house, it is well to plant a couple of fairly early sorts, and have the others come along in succession.

The following is a list of varieties that may be relied upon for all the three houses, in their order of succession from early to late in each section:

EARLY HOUSE

Nectarines—Cardinal, Early Rivers, Advance, Stanwick Elruge.

Peaches—Duchess of Cornwall, Hale's Early, Peregrine, Noblesse, Duke of York.

MIDSEASON HOUSE

Nectarines—Early Rivers, Lord Napier, Stanwick Elruge, Humboldt, Spencer.

Peaches—Early Rivers, Peregrine, Dr. Hogg, Grosse Mignonne, Bellegarde, Princess of Wales.

LATE HOUSE

Nectarines—Chaucer, Pine Apple, Spencer, Victoria.

Peaches—Dymond, Bellegarde, Princess of Wales, Thomas Rivers, Lady Palmerston.

The last-named variety is not especially good in flavor, but, ripening just after the others are gathered, it will extend the season for about ten days longer,

which may at times be a consideration, especially so when large quantities of hothouse fruit are produced. Lady Palmerston may be improved somewhat in quality by allowing it to remain on the tree until it is fairly well ripened, as it is naturally a firm fruit.

There are many other valuable varieties to be recommended for forcing under glass. A more extended list may therefor be of service here:

Peach Goshawk
A very large midseason variety, with exquisite flavor

NECTARINES

Albert Victor—Large green with dull red cheek; ripens about the same time as Pine Apple.

Byron—Very highly colored; yellow flesh; excellent flavor. Good for growing in pots or tubs.

Dryden—One of the highest-colored white-fleshed varieties that I know of.

Elruge—One of the older varieties, with fine rich flavor, and still worthy of a place on the fruit list.

Improved Downton—A variety that was raised from the Downton Nectarine, which is a decided improvement on the former.

Milton—A very fine variety for either planting in the border or growing in tubs. It is highly colored and can be recommended for its handsome appearance and rich flavor.

Newton—Also excellent for our climate and particularly good for growing in tubs. The fruit is large, with white flesh, parting freely from the stone. It has a distinct Stanwick flavor.

Rivers Orange—A yellow-fleshed sort; not quite as large as some of the others, but the flavor is all that could be desired. It is a bit earlier than its parent, Pitmaston Orange, and a decided improvement on the old standby.

PEACHES

Albatross—A fine Peach; seedling of Princess of Wales, which has proved one of our very best as a late variety.

Alexander—A very early and popular American variety, with a brisk, juicy flavor.

Alexandra Noblesse—Resembles Noblesse very much. Yields large fruit, pale green in color with a very rich flavor. A strong, robust grower, and heavy crops may be gathered from trees grown in tubs.

Dagmar—A second early; very downy skin, deep rich color, and handsome.

Dr. Hogg—Handsome midseason Peach of healthy constitution and excellent for tubs or in the border.

Foster Peach—American variety. Undoubtedly one of the best yellow-fleshed varieties for growing under glass. The fruit is large, rich in color and highly ornamental for indoor work.

Gladstone—Valuable as a late Peach.

Goshawk and Dymond—These two resemble each other and ripen at the same time. Both are strong, robust growers, and are good varieties for growing in pots or tubs. They are somewhat deficient in color, but the flavor is all that could be desired.

Early Grosse Mignonne—A midseason Peach of medium size and excellent quality.

Merlin Seedling from Early Grosse Mignonne; larger than its parent and particularly rich in flavor, ripening at about the same time.

Sea Eagle—A late, very large Peach of good color.

Nectarine Peach—So named because its skin is smooth, like that of a Nectarine; it can be highly recommended as a late variety.

Crawford's Late—Highly recommended as a first-class, late Peach; large and handsome. It is one of the standard varieties for outdoor work, but can also be grown under glass.

Mountain Rose—Can be relied upon for growing under glass as a second early Peach. I have produced very fine fruits from this variety both in the early and in the midseason house; it is of good quality and color.

This list may seem longer than is necessary, but it is very interesting to test different varieties. Where pot or tub fruits are grown extensively, a comprehensive list to select from gives opportunity to increase and vary one's col-

PEACH PEREGRINE

PEACH THOMAS RIVERS

The above two varieties will meet a demand for large, showy Peaches—Peregrine for midseason and Thomas Rivers as a late kind

lection, for when grown in pots or tubs fruit trees do not need the same space as those set out in the border.

The list might be still further extended, but I think that it will be found sufficient for both early and late forcing. I have omitted some of the earliest kinds, for the reason that I do not approve of growing more of the very early sorts than is necessary, as the midseason and late Peaches are superior, both in size and quality. The grower intending his fruit only for the market and anxious to get it out as early as possible will probably want more of the early sorts.

CHAPTER XIX

POT FRUIT CULTURE AND ITS ADVANTAGES

House Suitable for Pot Fruit

POT fruit has been grown for many years with much success, but only in the past ten or fifteen years has it been grown to any extent in this country. When this method was first started, many years ago, it was generally thought that it would be impossible to produce high class fruit under these conditions. Growers said that starvation would be the result, or that the trees would be exhausted within a few years. But time and experience have taught us differently. It has been proved that trees adapt themselves admirably to this restricted way of growing, and that they are capable of carrying good, average crops every year. In our climate the life of the trees may, with good care, be safely set down as ten or fifteen years, and this is long enough to satisfy most fruit men.

Not only are the trees good for many years, but the fruit taken from them is of excellent quality, with intense color. The Pear, for instance, will produce finer fruit here under the pot system than in Europe. Our dry, bracing climate secures a good set annually. The improvement in Pears grown under glass is very noticeable, both as to size and finish, provided the proper kinds are selected. In speaking of this class of fruit, it is customary to use the term "pot fruit." At the establishment of Thomas Rivers and Son, England, which is the home of the pot tree system, pots are decidedly preferred to tubs. But there is a wide difference in atmospheric conditions between England and our country; the former has a moist, moderate climate, while that of the latter is dry, often with extreme heat. Therefore, tubs are to be preferred here when the trees get large enough for them. When I first began to grow fruit in this country, many years ago, I naturally clung to the training of my boyhood days, when the pot system was used. But I found out in the course of time that the pots are too dry and hot for the roots. I then tried plunging the pots, but this did not seem congenial to the roots, and I then tried the tubs. I now recommend tubs as being preferable to pots, that is, when the trees are large enough, or from a 15-inch tub up.

The advantages of growing tub fruit are many. In the first place, the work is interesting because a variety of fruit can be grown in this way. I may say that the orchardhouse is one of the most tempting of the whole range, from the

time that the trees are started until the fruit is fully developed; particluarly so when the trees are shapely. An orchardhouse in full bloom is a lovely sight, but to see those little trees later on loaded down with their perfectly developed fruit calls forth exclamations of wonder and delight. The quantity of fruit that can be grown in a moderate-sized house is truly surprising.

There are still other advantages of tub fruit. Many a house stands idle during the Summer months that could be used to good advantage by placing some of these trees in them, for they will grow well in any light house where they get the full sunlight; and where a house is set aside for tub trees, it may be used for other purposes for four months of the year at least, that is, with due precaution as to the class of material grown therein. Do not use it as a planthouse, for it may become infested with mealy bug, which is not a desirable guest to have in a fruithouse. The orchardhouse, moreover, gives results the first season, if pot grown trees are secured, as should be done. Taking everything into consideration, therefore, pot grown fruits have many advantages in their favor. Apples, Apricots, Cherries, Figs, Pears, Plums, Peaches and Nectarines, all adapt themselves to the orchardhouse treatment. But a good-sized house is necessary to grow all these kinds with a fair complement of each.

I presume that most of this class of fruit is grown in private establishments, and generally with one house set aside for that purpose. All the fruit mentioned above will thrive together, with the possible exception of Cherries. My experience with Cherries in a mixed house has been anything but encouraging, for they have a tendency to drop their fruit before stoning. I shall have more to say later as to the best kinds to be grown under glass in tubs or pots.

As regards the arrangement, it is preferable to keep each kind together as much as possible, since they will not all bloom at the same time. Pears, Plums and Apples, when in bloom, need a dry, bracing atmosphere, or it will be difficult to dry up the pollen. If we have a good, bright sun during this period, there is little cause for worry, as then the pollen will distribute itself freely and a good set will be almost assured. But if we are unfortunate enough to get a damp, cloudy spell at this time, it is best to keep on some air, with more fire heat if necessary. Pears and Plums will absolutely refuse to set in a close, humid atmosphere.

In ordering trees for the orchardhouse, it is best to decide beforehand what style of tree is to be preferred, whether bush, half standard or pyramid. Half standards are excellent for Peaches and Nectarines; but taking all things into consideration, I decidedly prefer to have most of the trees in pyramid form. Trees in this shape certainly give a house a more finished appearance. A pyramid Pear or Plum tree in full flower is a handsome sight. There is no bare stem, but a fully furnished tree from the tub up.

It is important to note here that the best stock obtainable should be procured. Get good, thrifty, young trees. This class of trees, as it comes from the nursery, requires about 11-inch or 12-inch pots for the first season. One of the most serious blunders that we can commit is overpotting. Trees can be kept in much better health by confining them to comparatively small tubs. This holds particularly good after we have had the tree for some years. With

systematic feeding a 20-inch tub can support a large tree. While the trees should be repotted every year, they do not therefore require a larger shift each time; they can often go back into the same size pots if the ball is reduced somewhat. This may seem a waste of labor, but if a tree which is kept for ten or fifteen years is given a larger shift each time, the tub would soon be an ungainly one, and the tree would not thrive so well as when the ball is reduced somewhat each time it is repotted. By all means repot once a year. The new soil around the roots seems to give the tree a new lease of life, for the enormous quantity of water required during the growing season naturally exhausts the soil.

I need hardly dwell on the fact that this kind of fruit needs close attention. Any neglect or any carelessness as to watering or feeding will soon become apparent, but if proper care is given to the trees, they will yield a rich harvest. If the orchardhouse is the only house on the place, fruit may be gathered for at least ten weeks, if there has been a proper selection of varieties. When the Peaches and Nectarines are over, then come the Plums and Pears.

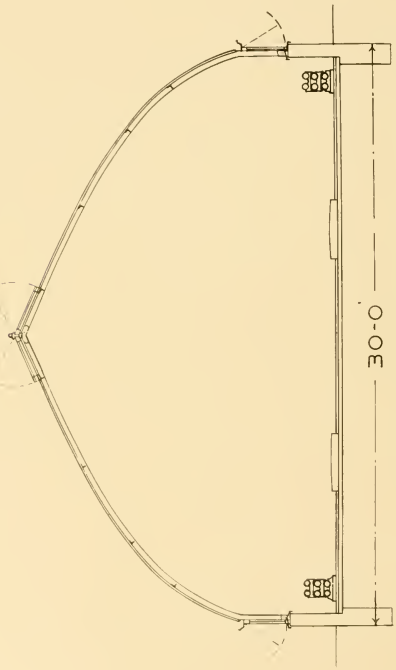
As to the expense, a good-sized house may be stocked for a nominal sum. There is, moreover, no border to be prepared, for the tub fruit may be grown in any decent house, and with care and judgment a good crop is assured each year. Many of our best fruit growers are beginning to realize the advantages of pot fruit culture, and this branch of our profession is growing apace. A large number of private establishments today have their collections of pot fruit, and the popularity of fruit thus produced will increase as its requirements become better understood by our growers. The grower who follows closely the lines laid down in this book will surely be rewarded by good crops.

As to the fruit that can be grown successfully in the orchardhouse, Plums and Apples may be removed into a somewhat cooler house when the fruit is fully grown and commencing to color, or be taken even outside, if protection is provided against destruction by birds; they will finish up to perfection, especially Apples, which acquire a more intense color, the finishing touch so desirable before we can pronounce the fruit perfect in every detail.

HOUSE SUITABLE FOR POT FRUIT

While the success or failure of pot fruit depends to a great extent on its cultural treatment, yet the style of house and its construction should be carefully considered. Good pot fruit may be produced in almost any glass structure, if the house is light and in a position where the trees receive the full benefit of the sun. Orchardhouse fruit is impatient of any dry atmosphere, therefore do not use much cement for unnecessary walks. The plainer and more simple the interior construction is, the better it is for the health and vigor of the trees. No benches are needed. The best flooring for setting the trees on is the natural border. If the soil is inclined to be soft, give it a good coat of coal ashes, or any other material that will hold moisture. This will give to the border a neat and clean appearance. One walk in a house of this kind is sufficient. Bear in mind that the orchardhouse is for the sole purpose of producing high-class

fruit, and the interior should therefore be as plain as possible and free from ornamental work or unnecessary masonry. A cement floor gives a neat appearance to a house, but it keeps out the natural moisture, which no amount of sprinkling can supply. The fruit produced under these conditions will not be



Section of House for Pot Fruit

This section gives a clear outline for an ideal orchardhouse 30 feet in width, simple but practical. Such a house should have two walks, as indicated in the sketch, and both top and bottom ventilation, which is essential to ultimate success

satisfactory, either in size or flavor. I emphasize this seemingly small matter of the flooring for the border, for much depends upon the natural evaporation from the border, as regards the size and flavor of the fruit. It is the close attention to details which makes for success, here as elsewhere.

The trees may be arranged along the border to suit the grower's individual fancy, so long as they are not overcrowded. We cannot expect the best results if the trees stand too close together. Each tree must be clear of its neighbor, so that both the foliage and the fruit may get the full benefit of the light and sun. The size of the house will depend upon the demand made upon it, and it may run east and west or north and south, according to the location at command, though it would be preferable to have it run north and south, for this would give all the trees a more equal sunlight. An even span roof house is better than any other shape. It may vary from twenty to thirty feet in width, while the length will correspond to the number of trees to be grown. Set the trees about four or five feet apart. Although this may look a bit thin for the first season, the house will be furnished nicely the second year.

One of the main points to be considered in building a structure of this kind is head room. While a low built house may seem ample for the young stock, yet it will hardly do for the trees as they increase in size from year to year. There should be head room enough along the sides to accommodate trees six feet high, or in other words, have five or six feet from the border to the eaves.

Ventilation is of vital importance and it should be plentifully provided for, both at the top and bottom on each side. During our extremely hot spells all the ventilation procurable can be used to good advantage. Plenty of fresh air as the fruit is ripening will be found to improve the flavor, which is all-important. I think I have made it plain that the best house for orchard fruit is just a simple house without any frills.

For the heat it is not necessary to lay in a large system of pipes, as this fruit does not require any extreme temperatures. In fact, too much artificial heat is decidedly injurious, especially in a mixed house, such as those containing Pears, Plums, Apples, etc. Furthermore, where all the different kinds are grown together, I am not in favor of starting the trees until the middle of January. Not that it is impossible to do so, but I have found that success is almost assured if they are started after the turn of the season, whereas if done before that we are taking chances with fruit like Pears and Plums, whose setting qualities are decidedly more uncertain in the short days than those of Peaches and Nectarines. As to the amount of pipes, or the heating capacity of such a house, there should be enough heat at command to hold the temperature at 50° even in very cold weather, a temperature that would be sufficient artificially. I indicate here the requirements merely in a general way, leaving all the details of construction to the greenhouse builders, who thoroughly understand their business. While the style of house may seem of small importance to the superficial observer, yet experience has taught us that if we want to carry on this work successfully year after year and have our trees always in full vigor, we must have our house in agreement with their needs. The ideal house is one that will give off an abundance of moisture, but any house that gives off a dry atmosphere is not a first class orchardhouse and will not produce the best results.

CHAPTER XX

POT FRUIT—CULTURAL DIRECTIONS AND FEEDING

POT fruit may be started into growth any time from the 1st of January to the 1st of March, according to the demands for ripe fruit. If the earliest varieties are to be gathered about the middle of May, then the house must be closed up January 1st. Bear in mind that the fruit must be brought along gradually, in order to get the best results. In private establishments, where there is other fruit to depend upon, it is better to bring on the pot fruit a trifle later in the season; but this all depends on circumstances. Pot fruit, when well grown, is a pleasure to look upon, but if neglected in any way, it is a miserable failure. It naturally needs closer attention than trees planted out in the border. If the orchardhouse receives good care as to watering, feeding and all the other necessary details, it will more than repay for the extra labor bestowed upon it. One can easily get enthusiastic over pot fruit in good condition. It is therefore to the grower's advantage to keep his trees in good health, which is the main secret of success in this line. Any one who undertakes the culture of pot fruit must have a love for his calling. Such a man will make a success of it, even if his experience be limited, and as the years go by and he gets more fully acquainted with his trees and their requirements, they become as companions to him. This work is indeed intensely interesting from start to finish—watching the tree from the development of the blossoms to the maturity of the fruit.

I have heard it said more than once, that pot fruit is not as fine as that grown in the border, and that the flavor is not quite so rich. Where such is the case, the pot fruit is not receiving proper care. If the fruit is checked in any way it will inevitably show. For instance, if the trees are allowed to suffer for want of moisture at the roots two or three times while the fruit is developing, or if too much water is given, the reaction from either will be sufficient to produce inferior fruit. Such occurrences are apt to give the pot fruit a bad name unjustly. But I can say, unhesitatingly, that the flavor of pot fruit properly grown is all that could be desired, and equal to that of fruit produced in any other way.

The first thing to be taken into account for pot fruit is the temperature. When starting fruit any time from the first to the middle of January, a night temperature of 40° is needed for the first week, increasing the day temperature 10° or 15°, according to the weather conditions. As the buds begin to swell, gradually increase, both night and day, and as the trees are coming into bloom,

50° by night with a rise of 10° or 15° by day will be agreeable. The main object is to get as nearly as possible to Nature's temperatures. As the fruit advances, the heat may also be increased, until 55° or 60° by night may be maintained, increasing that of the day accordingly. This is sufficient for the artificial heat. As soon as the outside thermometer registers above 60°, never close the ventilators down tight. It is much better to leave a couple of inches of air on. Then as the Summer temperature increases, or when the thermometer no longer falls below 65° at night outside, considerable ventilation can be kept on, for orchardhouse fruit delights in an abundance of fresh air, provided that the temperature does not fluctuate too much. Herein lies the secret of success in producing perfectly developed fruit. We have in our hands the means of keeping a fairly even temperature. The house, though covered with glass, will never become too hot, if there is plenty of ventilation, even in extremely hot weather. The great advantage of having this fruit under glass is that it is protected against severe storms, and when a cold spell comes along, as happens occasionally even during the Summer months, the ventilation may be reduced some, which will counteract the outside conditions. By thus regulating the temperature we can produce fruit in the orchardhouse which is far superior to that grown outside. But grow your pot fruit in a close, humid atmosphere, and you will produce a poor quality, with thin and puny foliage, ready to catch the first disease that comes along. While I am a great believer in plenty of fresh air, I do not wish to be misunderstood on this important point. It would be a serious mistake to admit fresh air regardless of the temperature. There is nothing worse for the trees than a cold, cutting wind. Keep as even a temperature as possible, and avoid, above all, too much coddling. Then you will get fine flavor and excellent color.

As to watering, I have always found that a man proficient in the art of watering is a most valuable help in greenhouse work. No matter how carefully the potting material has been selected, or the potting may have been done, careless watering will ruin the best of preliminary work. This holds good especially as regards pot fruit. If a plant is watered to the extent of souring the soil, the injurious effect is difficult to remedy. The best plan to follow in watering a tree is, give a thorough watering so as to penetrate through every particle of the soil in the tub or pot, then no more until necessary. It is impossible to give definite rules here, as some soils dry out much faster than others. The experienced grower knows the importance of proper watering, which requires thought and good judgment. Fruit trees will take a liberal supply of water when in full or active growth; but be careful when first starting up the trees, for at that stage the roots are practically dormant and too much water will injure them. There is no foliage to draw the surplus moisture, nor is there much root action. When first turning on the heat, it would be well to give the trees one good watering and then no more until absolutely necessary, or in other words, keep them on the dry side until growth begins and the root action is more lively. Increase the amount of water as the growth and the foliage increase, but never sour the soil. Overwatering will cause the roots to decay, and you will have a sickly lot of trees.

Plant life finds its best expression through the foliage. The surface of the tub is apt to mislead, for it may often look dry on the surface while there is plenty of moisture underneath. Therefore, so long as the foliage stands out, bold and full of sap, we can rest assured that the tree is not suffering for want of moisture at the roots. But do not under any circumstances allow the foliage to wilt for lack of water. The grower who watches and studies the foliage carefully can judge pretty clearly as to the requirements of his plants.

The trees should be sprayed two or three times a day in bright weather, from the time they are started until they commence to bloom. Then hold off until the fruit is set. On very bright days the house may be damped down about mid-day; around the Pears and Plums the border should be kept a bit drier, for the pollen of these does not dry so quickly as that of the Peach and Nectarine. After the fruit is set the spraying should be resumed, both morning and evening in very bright weather, while in damp, muggy weather the trees are better without it. Also keep the border damped down at least once a day, for a moist atmosphere is beneficial to both trees and fruit when the latter is in full growth. Spraying can be dispensed with as the fruit commences to ripen. Keep the variety that is ripening a little drier at the roots; this will enhance the flavor, provided that it is not carried too far, for, as I have said, never allow the tree to get so dry that the foliage will flag.

The mode of fertilizing the blossoms depends on the time when our trees come into bloom. Bees are among the very best distributors of pollen. They are welcome visitors to the orchardhouse in bloom; industriously going from flower to flower, they pollenate each and every one perfectly. If the trees come into flower before the bees leave their Winter quarters, then artificial means must be resorted to, or hand-fertilization, which is a simple operation. The pollen must be perfectly dry, and this may be easily ascertained before going over the bloom. When dry, it can be readily seen flying in all directions. As the pollen gets ripe, so that it will distribute easily, apply it either with a camel's hair brush or with a rabbit's tail tied to a stick. I prefer the latter. Go over the blooms once at mid-day from the time the first lot of flowers are ready until they are all set. Just brush the blooms lightly. If the pollen is in good condition, the brush will be loaded with it in a short time, and under these conditions the set will be perfect. Where Nature has free sway, she provides the different kinds of insects for this important work, but in producing fruit out of their natural season, artificial pollenization must be resorted to. When one gets familiar with the work, the trees may be gone over in a short time.

Feeding is another point where the grower may show his skill. The benefit of systematic feeding is very pronounced in pot fruit. The amount of feeding that these trees will profitably take is surprising, when it is increased gradually. The novice in fruit culture must study this important question long and attentively before he can hope to excel with pot fruit. I could write a whole book on the subject of feeding alone. It is easy enough to lay down the main principles and the benefits to be derived from the different foods, but much depends on circumstances and individual conditions. A healthy, vigorous tree can absorb more food to good advantage than a weakly growing one. There-

Pear Princess

This Pear is a seedling from the old, well-known variety, Louise Bonne of Jersey, but larger and finer in every respect

fore, it is not wise to dictate as to the amount of feeding that shall or shall not be done through the season of activity, in order to get the best results. All I can say here is: keep a close watch on your trees after feeding, both as to the roots and the foliage, which are two of the principal life organs of the plant. If we find roots coming to the surface soon after feeding, it is a sure sign that it is agreeable and the tree is receiving sustenance.

I think it a weakness of most writers on this interesting question that they present the bright side, only dwelling on the benefits to be derived from the food. Of course it is more pleasant to record our successes than our failures. Still, if we look back over the years we have spent in cultivating plants, we cannot close our eyes to the serious errors we may have committed through over-feeding. I admit that I have been at fault here more than once, but I have profited by what I have learned thereby, although it has often caused me worry and annoyance. Defeat is a bitter pill, while success tastes sweet. No young grower should lose heart, even though things do not at first come up to his expectations. Whoever loses his grit is doomed to go down; the man who is determined to profit by his mistakes will come out victorious in the end.

Mistakes along these lines first turned my thoughts toward the study of the foliage. This is a study worthy of the consideration of every grower. The foliage is the life, or the lungs of the plant, and if it is not perfect, everything is lost. If we are carrying a heavy crop of fruit and the foliage goes wrong before the fruit is fully developed or ripe, it will be a miserable failure. We may be told that all foliage is green and looks alike. Study it closely and you will find out the difference. As the mother of a family need only look at her child in order to know whether it is well or ill, so the good florist and gardener can judge his plants by their appearance. But the grower must love his plants as a mother loves her child. We must keep our foliage full of sap and leathery to the touch, full of substance, with the veins standing out pronounced. Such foliage will help to produce good fruit of superior flavor.

By way of preface to a brief explanation of systematic feeding, I may say that it is far better not to feed at all than to over-feed. Feed to the limit and no more. I do not advocate strong feeding at one time, but prefer it light and often. There is not so much danger in light feeding, and more can be administered to good advantage during the season in this way. I also advise an occasional change of food. The main point in bringing a crop to a successful issue is to keep the roots active. Surface dressing, applied about every ten days or two weeks, seems to give a new lease of life to the roots, for the feeding roots will absorb it within a few days. For this top dressing I have obtained the best results with Thomson's manure and Ichthemic guano, used alternately. Mix it in the proportion of eight or ten parts of soil to one of manure, and put a light dressing on the surface of each pot or tub, a couple of handfuls to a 15-inch tub. Apply this every ten days or two weeks if your trees are in a healthy condition.

Watering with manure water three or four times during the season is good. The drainage from the farm barn is excellent for this purpose, weakened down with clear water. I find occasionally that the foliage turns a bit yellow, or loses

the green color so much desired, especially early in the season of growth. Bon Arbor will rectify this evil, used according to directions. A certain amount of lime and potash is essential to all stone fruit, but as the make-up of different soils varies considerably, it would not be advisable on my part to prescribe any given quantity. It is enough for me to say that they are necessary and should be applied in some form. If lime is needed, the best way to use it is in the potting compost. Wood ashes may also be used in the same manner. With a regular system of feeding, a large tree may be grown in a comparatively small tub, with results in favor of this method.

I have said that orchardhouse fruit delights in an abundance of fresh air; but it should not be admitted in a haphazard way, especially during February and March and at times far into April. If a cold, cutting wind is blowing from the east, open the ventilators on the west side, if needed, or on the opposite side, as the case may be. The main object in view is to avoid cold, cutting winds while admitting air whenever the conditions call for it, and particularly so when the trees are in bloom, as too much coddling at this stage endangers the desired set. Keep a circulation of air on whenever the thermometer registers above 60°, and as the hot weather sets in, admit all the air possible, both top and bottom, closing the bottom ventilators at night, but leaving the top ones on, or just bringing them down enough to shed the rain in case of storm.

CHAPTER XXI

POT FRUIT—PINCHING THE SHOOT—THINNING THE FRUIT

IN growing pot fruit it is well to bear in mind that it entails but a trifle more labor to maintain a well-balanced, shapely tree. This may be secured largely by systematic pinching during the season of growth. While it is not necessary to pinch to the extreme, there should be no crowding of shoots. Have each shoot free and easy, so that the sun may get a chance to penetrate through the branches. The tree will then produce far superior wood, which means finer fruit. When the trees start into growth, there are often many more shoots than are necessary to furnish the tree. In such case some disbudding may be done; or, better still, pinch back to two or three leaves, with the object of forming fruit spurs for the following season. Every fruit man of experience knows the value of a tree well supplied with fruit spurs, for this means a plentiful supply of fruit, generally of good quality.

Pot fruit may usually be had in two or three forms—bush, half standard and pyramid. The two former call for the same treatment as regards pinching. The only difference between them is, that the half standard has a foot or eighteen inches more of clear stem than what is termed the bush form. Peaches, Nectarines, Cherries and Apricots do admirably as bush and half standard; while Pears, Apples, and Plums are best as pyramids. Peaches and Nectarines make handsome trees in pyramid form. Bush and half standard should be pinched back when the new shoot has reached five or six inches; some of the shoots will need pinching before others, for a well-balanced tree. The vigor of the tree will determine as to how many times it is to be pinched during the season. Sometimes certain shoots will be found to take the lead or will grow much stronger than others; these must be kept pinched back or be cut away altogether. If all the shoots break away again, as they undoubtedly will, pinch again at five or six inches, and if the branches crowd too much, thin away some of the useless growths. By pinching in this manner, there will be no serious trouble with lateral growths.

Pyramids require somewhat closer attention than the bush forms to keep them in proper shape. The growth of pyramids will generally commence on the top; therefore, the most advanced shoots should be pinched first. In any case, pinch the bottom shoots last, as the strength is more apt to leave the bottom branches in preference for the shoots higher up, so the bottom growth must be encouraged rather than pinched too freely. Attention should also be paid to the

center shoot. Keep the main center growth erect each year, otherwise it will be impossible to secure a well-balanced tree. It is not necessary to pinch pyramids very severely—at about the third or fourth leaf. Then, as the growth advances, pinch again as recommended for the first pinching. If the trees are growing satisfactorily, pyramids will need pinching about three times during their season of growth, with the exception of the weaker shoots. The pinching may be discontinued toward the later part of the season, as there is then danger of exciting the back dormant eyes. It is also advisable to have one stake to each pyramid, so as to secure an erect growth, and give the tree a neat appearance.

If these instructions are followed, the trees may be kept in a fairly evenly-balanced form, with the exception of Cherries, Apricots and Figs, which have a tendency to be a bit ungainly. Cherries, in particular, will produce a few strong shoots, while the rest of the growth forms into spurs or clusters of fruit buds. The strong shoots must be pinched a few times during the season, but do not pinch Cherries too severely. Apricots should be pinched about every fifth leaf, to prevent them from occupying more space than they are entitled to. I do not recommend the Apricot highly for pot work, though it may find a place in the orchardhouse where a variety of fruit is desired.

The same applies to the Apple, which makes a handsome showing in the pot, and extra large fruit may be obtained in this way, but our open air climate is so favorable for its perfect development that I should recommend it for the orchardhouse more as a curiosity than otherwise. Some years ago I had some twenty or thirty varieties of Apples under glass. The crop was an excellent one and the size also was good, but for flavor and quality I would just as soon have an Apple from the open orchard. Apples grown in pots are very ornamental and excel most other fruits for appearance.

Figs can be grown successfully in pots, but they are handled best in a compartment by themselves, for the Fig will produce two crops of fruit during the season and when the first crop is gathered the second will be improved by keeping in a closer atmosphere until they commence to ripen. I shall take up the culture of the Fig later.

THINNING THE FRUIT

Pot fruit is, as a rule, well supplied with fruit buds. Considerable thinning must generally be done, for the trees should not be allowed to carry more than an average crop each year. For the first season, if the nursery stock is of the best and well supplied with fruit buds, and large enough for 11-inch or 12-inch pots, Peaches or Nectarines may carry ten or twelve fruits each; this depends on the variety, for some allowance should be made for an extra large growing variety.

Plums usually set their fruit very freely, if a fairly dry, bracing atmosphere has been maintained during their period of blooming. This means that considerable thinning will have to be done, as the plum will not attain to the highest perfection when overcropped. Only dessert or table Plums should be selected for this purpose, and therefore quality should be considered rather than quan-

PLUM DENNISTON SUPERB

This represents the top of a Plum tree grown in a tub, which has carried a heavy crop annually for ten years, and, as the picture shows plainly, is still healthy and full of vigor

tity. A good, thrifty Plum tree should bear the first year from thirty to forty fruits, according to the variety or size of fruit.

Apples and Pears may bear the first season from six to twelve fruits, according to the variety. Kinds like Souv. de Congress or Pitmaston Duchess Pear may carry five or six. More fruit may be left on each year as the trees increase in size. A Peach or a Nectarine which has developed normally for five or six years should be capable of carrying a crop of fifty fruits or more.

The thinning of the fruit should be done by degrees. This applies particularly to Pears, for these have at times a habit of dropping their fruit, until they pass a certain stage, or the fruit is a little larger than the thumb; after that there is less danger. Peaches and Nectarines may receive their final thinning when the fruit is about the size of a Walnut. Some writers advocate leaving on a surplus until they have passed their period of stoning, and it is probably well to do so where there is any difficulty with fruit dropping while stoning. But I think that when the wood is thoroughly ripened in the Fall and the trees are subjected to the due amount of frost, they are not very likely to drop their fruit while stoning. If this surplus fruit is allowed to stay on the tree until the stoning is completed, the tree is taxed unnecessarily, or at the expense of the average crop, for after the stoning is completed, it does not require much more strain to ripen the fruit. It is well to understand the nature of orchardhouse fruit.

As I have already explained the method of gathering Peaches and Nectarines, in the section on Peaches and Nectarines under glass, I will refer the reader to those pages.

The Pear is perhaps the most exacting of all fruit. If gathered too soon, it will shrivel and be useless, and if left too long on the tree, it will become over-ripe. A Bartlett or a Madame Treyve, or any Pear of that nature, if gathered in proper season, is firm, rich and juicy, but loses its flavor if allowed to hang too long, becoming soft and almost disagreeable. When the fruit separates readily when lifted to a horizontal position, or the stalk leaves the wood spur without any pulling, it is a fairly sure indication that it is in the best possible condition for picking. If the fruit is then kept for a week or ten days in a cool dark room, or until it has turned to a golden yellow, it will be firm, rich and juicy. If allowed to stay on the tree until over-ripe, it will be decidedly flat and mushy.

Plums, on the contrary, may be allowed to hang until they come off with the slightest touch, retaining their full, rich flavor. Varieties like The Czar, Mallard or Denniston Superb, Golden Esperen and many others are ideal for table use, and when highly finished are eagerly sought after as a dessert luxury. They surpass in richness of flavor any Plums that are grown in the open field or garden.

CHAPTER XXII

POT FRUIT—TROUBLESOME DISEASES AND INSECT PESTS

ONE of the best preventives against fungous growths and noxious pests is a clean start. The very best time for house cleaning is when the trees are dormant. They may then be cleaned in short order by fumigating with hydrocyanic acid gas, if the grower understands how to use it, but in careless hands this may cause considerable damage. I have described the method of handling it in another chapter, to which I refer the reader. The trees may also be washed down where time is no object, and here also it should be noted that it is not safe to use a very strong wash on the fruit-bearing wood of Peaches, Nectarines, Apricots, etc. The safest way is to wash all the wood except the fruiting wood, as the fruit buds are very easily damaged. This may not be noticed until the trees have started growth, when the injured fruit buds will drop instead of developing.

A solution of whale oil soap makes a very good wash, using enough soap to cause a lather, provided the same strength is not used on the fruit buds. Gishurst's compound also makes a good wash.

With a clean start half the battle toward having clean fruit trees during their season of growth is accomplished—that is, with good treatment—but carelessness in the matter of temperature or checks of any kind will invite the spread of insect pests and diseases. Insects, as a rule, will not attack a strong, vigorous tree half as readily as they will a weak one, and the same may be said of fungous diseases. Any pot tree that shows signs of weakness or deterioration should be discarded, regardless of age; it is only occupying valuable room to no purpose, and will cause no end of trouble. Two or three sickly trees among fifty healthy ones will show up more prominently than all the others put together, thus detracting from the appearance of the house.

Green fly undoubtedly causes more trouble among pot trees than it does when it attacks trees planted in the border, that is, when they are in blossom and before the fruit is set. With free use of the syringe, there is no excuse for green fly. Anyone who has handled pot fruit knows what havoc green fly may make within a few days. It spreads rapidly and the damage which it can accomplish within a short time is almost incredible. It is much better to fumigate the house, in order to eradicate the pest, than to spray the trees too severely; and smoking the house a few nights in succession is better than too strong an application at one time.

Pear Mme. Treyve

This photograph represents the top of a tub Pear tree cropped annually for eleven years. It shows the productiveness of the Pear trees and their adaptability for growing in pots or tubs.

Different materials may be used for fumigation with good effect. Years ago the old reliable remedy was tobacco stems, but with the great advance that has been made in the greenhouse industry within the last twenty-five years we have more modern insecticides with which to fight insect pests. Our thanks are due to the manufacturers for putting the various nicotines and formulas upon the market in a condensed form, which simplifies our labors, and makes them more effective. Each grower prefers his own particular brand of insecticide. As the old saying goes, "There are no two alike." If we all were of the same mind, trade would soon fall away. If you have found an insecticide that means death to the insect with no harm to the tree, hold on to it, until you are fully satisfied that you have found something better.

Manufacturers of insecticides and fungicides have kept pace with the greenhouse builders and the growers, so that we now have an excellent assortment of these remedies. An effective insecticide or fumigant around the greenhouse is the best friend of the gardener or florist. Nico-fume, tobacco paper and aphis punk are excellent for eradicating both green fly and black fly. Nicoticide and XL. All fumigating liquid may also be used with excellent results. Full instructions for using the different brands are given with each. It is well, however, to be cautious in using a new insect eradicator until thoroughly acquainted with its virtues. It is an easy matter to increase the strength gradually, until the desired results are obtained. An overdose is injurious to plant life. It is important, also, to select a suitable evening for fumigating. It should be a calm, quiet night, for two reasons: The smoke will stay in the house longer, and it will distribute itself more evenly over the whole interior. Above all things, avoid fumigating too strongly.

The spread of red spider depends chiefly upon the man employed in syringing the trees. It is not so much a question of the quantity of water used, as of the way in which it is done. I am opposed to very heavy spraying. The main point in fighting this pest is to spray underneath the foliage effectively, which any man can do who is interested in his work. A check in any way—lack of moisture at the roots, or any other neglect—will induce the spread of red spider, thrips and other troubles. The best policy here is to adopt measures that will prevent their appearance, but if they do come, in spite of all precautions, then eradicate them as quickly as possible, which can be done by effective spraying, provided there is a good force of water.

Leaf roller is a very destructive little insect, which is more troublesome among Pears, Plums, Apricots, Cherries and Apples than among any other fruit. It is more noticeable in some seasons than in others, and if allowed full sway it will do considerable damage. It usually appears just as the young foliage begins to unfold, at a stage when we cannot fumigate or spray because the trees are in blossom. It is easy to detect on the tender foliage, and may often be found among the fruit blossoms, busily eating off the pistils, thereby destroying both bloom and fruit. Nearly all of these noxious pests have a clever way of protecting themselves; though diminutive in body, they are strong enough to roll up the leaf, with the help of their web, hiding inside, as a protection against harm. Or, they will fasten two leaves together

with their fine web and hide between them. It is extremely interesting to watch this insect and its marvelous modes of protection, but for all its ingenuity we are compelled to fight it if we want to preserve our crops. The amount of damage the leaf roller can do in its short span of life is enormous. The only remedy that I can suggest is to hand-pick the insects from the leaf or the blossom before they make much headway. To my mind there is nothing more unsightly than injured foliage, aside from the fact that it prevents the development of perfect fruit.

Mildew must also be guarded against. It will spread rapidly under certain atmospheric conditions, such as sudden changes in temperature, or too close an atmosphere, or in other words, coddling. Some sections of the country are more subject to mildew than others. Trees that have once been attacked by mildew are more readily infected a second time; but it is as easy to check the spread of mildew in the orchardhouse as in the peach-house, by proper attention to airing. If there is a sudden change in the temperature, even during the Summer months, reduce the air somewhat; and be careful not to syringe the trees in very cloudy or damp weather. A light dusting of the infected tree with powdered sulphur will also check mildew.

Borers will attack all the fruit trees except Pears, which they do not seem to trouble much. Neither will they make the same headway with Plums as with Peaches and Nectarines. They must be fought as soon as detected. Their burrows must be opened up with a knife. Sometimes they are difficult to get at; in this case use a piece of wire and probe down until you strike them, for it is a question of killing the borer or the borer killing the tree.

CHAPTER XXIII

POT FRUIT—TREATMENT OF TREES AFTER THE FRUIT IS GATHERED

AFTER the crop is gathered, pot fruit should receive the same treatment as all other trees. Give them all the care possible in the way of watering, spraying and even a light feeding once in a while. This will build up the wood and bring the buds to the highest state of perfection. If these trees are treated carelessly in any way, they cannot be expected to yield a rich crop the following season. They may be placed outdoors, preferably in a sheltered location, where they receive the full benefit of the sun. A position near the greenhouse will be found to be convenient for the man in charge; then the trees will be more likely to receive their due share of attention. Trees in tubs require enormous quantities of water in their growing season. This exhausts the soil, even though heavy feeding has been done throughout the Summer months; therefore, repotting or retubbing should be done once a year, the best time for this operation being the Fall, just as the fruit buds are fully developed, or the foliage is taking on its Autumn cast. It is not necessary to wait until the trees are bare of leaves. I prefer, in fact, to retub before they have lost all their foliage. Early forced trees are ready for retubbing before late fruit, although there may be only a difference of ten days or so. The trees are usually in good shape for repotting from the middle to the end of October. Then, again, the soil in the tubs should be considered with regard to moisture; it should be in such a condition that everything works freely when reducing the ball. On no account retub the trees when the ball is very wet; neither should it be too dry; always try to strike the happy medium. As every ball must be reduced some, it will be much more easily done if the soil is just right, and the roots will benefit in having the soil friable. The amount of the reduction must be left to the grower's judgment, but it is a serious mistake to over-pot. For a Peach or Nectarine that has been bearing fruit for eight or ten years a tub fifteen or sixteen inches in diameter inside measurement should be sufficient; by this may be figured the reduction necessary if the trees are repotted once a year. The roots will more readily take hold of the new potting material after being reduced. Loosen out all the roots around the ball and shorten back with a sharp knife any coarse stragglers. A clean cut will callus over readily, whereas a rough cut may cause decay. The fibrous roots are the main support and these should be taken care of. The best way to reduce the ball is to use an iron

prong one-quarter to one-half an inch in diameter, with the end a bit pointed. With this an inch or so of the old soil may be removed without breaking the roots, leaving a network of fibrous roots around the ball in condition to work their way into the potting material after repotting.

Fruit trees may be seen growing luxuriantly in the open field or orchard, producing an abundance of fruit in an apparently sandy soil, particularly Peaches and Nectarines. But to use a sandy soil for fruit in the orchardhouse, where the trees are confined to small root space, is the first step toward inviting failure.

Plum Denniston Superb

An excellent variety for table use. A week or ten days earlier than Green Gage

Nor would it be well to go to the other extreme and use a heavy clay soil. While it may be impossible to secure in every instance just the right kind of soil, the best obtainable should be used for the purpose. The ideal soil is a good, rich, fibrous loam, such as has been laid down in pastures for some years—soil with good body to it, but not of a sticky, clayey nature.

It is best to prepare the soil three or four months in advance. If the sod land is available, it may be plowed or dug three or four inches thick, and if it is full of fibre it may be stacked into a compost heap, adding one load of good, rich farmyard manure to every three loads of soil. Some writers recommend the addition of a small quantity of old mortar, but this is not necessary if soil of the proper texture is selected. It is not advisable to depend on the mortar,

as there are now different compositions used in plastering. While the sod should have body or lasting qualities to it, it must also be of such a nature as to allow water to pass through freely. As a guide, I have found that soil which will grow Roses and Carnations satisfactorily will also grow orchardhouse fruit. A week before retubbing the trees, chop down the compost and turn it over, to incorporate the manure thoroughly with the soil. As heavy rains in the Fall may occasionally interfere with the work, it is well to put the potting material under shelter, adding a fair sprinkling of ground bone and hardwood ashes. This will be all that is needed. I am not in favor of making the compost overrich, but prefer to give surface feed when the trees are in active growth. I would use the soil in a fairly coarse form, as it then does not sour so easily, and the roots will be more lively in a coarse compost.

Drainage is all important. It is not always a question as to how much drainage shall be put into the bottom of a tub or pot, but rather how best to prevent the fine soil from percolating through. Whether there is one or two inches of drainage in the bottom, it should be kept free from fine soil. A thin layer of sod will answer the purpose; or a layer of half rotten manure or any thing of that kind will stay the soil and prevent the clogging of the drainage.

In retubbing it is essential to firm the soil thoroughly around the roots, adding a small quantity at a time to make sure that it is worked evenly around the roots. Above all, guard against too large a shift. I know that it is much easier to repot by giving a liberal shift than a moderate one. Deep potting is also a serious error; the depth should be sufficient to just cover the surface roots. Use a suitable potting stick or rammer about one-half inch thick and two or three inches wide, long enough to reach the bottom of the pot. The soil must be made as firm at the bottom as at the top. When the potting is done, the trees may get one good watering. Let them remain outdoors. I prefer, in fact, to leave them out as long as possible, or until severe freezing sets in. Ten or fifteen degrees of frost will do no harm. It is natural for fruit trees to have frost, and a certain amount is beneficial. But in the case of potted trees, the pots must be buried in soil to prevent the frost from destroying the pots. I have occasionally left the trees outside until the end of December, with the result that when they were started every bud came away perfect, with extra strong blossoms. In Europe the trees are not allowed much frost; but conditions are different here. Toward Fall the wood of our trees is extra ripe, so that a few degrees of frost will not affect the buds. Try the experiment of taking in one half of your trees and leaving the other half outside as recommended, and I am sure that ever afterward you will allow your trees to get a certain amount of freezing.

The trees will not need much pruning if they have received good attention during their season of growth in the way of systematic pinching or thinning away any crowded branches. Still, there must be some Winter pruning, which may be done any time after the wood is ripened. Do not use pruning shears on the trees. While much work can be accomplished with them, yet the man who takes a genuine pride in his trees will always use the keen-edged pruning knife.

Before going into details as to the methods of pruning, it may be well to offer a few words on the peculiarities of some varieties. Peaches and Nectarines in general call for the same treatment in pruning, if the conditions are favorable; but at times some kinds are exceedingly shy of wood buds. Therefore, we cannot always prune as we would like. One of the principal points to remember in pruning is, always prune to a wood bud, making a clean cut close to the bud. Do not leave any wood beyond the bud, as any wood left will eventually decay. If the cut is made close to the bud the wound will soon heal over. Most of the fruit buds of Apples and Pears are produced from spurs, therefore both of these trees can be pruned fairly close.

The aim in pruning is to keep the correct form of the tree, whether it be pyramid, bush or half standard. Pears, Apples, Plums, and the freest growing Peaches and Nectarines make handsome pyramids; but any kind of Peach that is a bit shy in producing wood buds is best as a bush or half standard, as it could not be kept in a symmetrical pyramid shape. While pyramids should not be pruned back too severely, any projecting shoots should be pruned back, and if there are any signs of overcrowding, the poorest shoots should be treated, for no good fruit can be expected from a tree that is overcrowded with useless wood. The object in a pyramid is to encourage growth on the bottom branches as much as possible, and this may be accomplished mainly during the growing season by proper attention to pruning.

Cherries and Plums are usually plentifully supplied with spur wood, or rather fruit-bearing spurs, and as these generally do not produce much surplus wood, only the wood that projects need be pruned back, so that both bush and half standard may be kept in decent shape. They should be trained into as much of a bush form as possible, but the bottom branches, like those of the pyramids, should not be pruned too severely; some of the smaller shoots need not be pruned at all. If the highest branches show an inclination to rob the sap of the lower or weaker ones, shorten them back. Remember this rule for obtaining the best results: Never allow too much wood to remain on the trees, particularly in the bush and half standard. The sun must be able to penetrate through the branches, then there will be fine fruit with excellent color. Apricots should always be grown in bush or half standard form, and be treated accordingly, for they grow a bit ungainly.

PEAR BEURRE HARDY

Beurre Hardy is one of the very best for orchardhouse work. The fruit is large and of excellent flavor, and the tree may be kept in a symmetrical shape with little trouble

CHAPTER XXIV

VARIETIES OF FRUIT ADAPTED FOR ORCHARDHOUSE WORK

THE variety of fruit that may be grown in the orchardhouse and the long lists to select from must seem bewildering to any not in close touch with the work. A proper selection is very important. Nothing but the very best should be used for the purpose. It costs no more to produce the choicest kinds than the ordinary varieties. A man working among fruit, who is a keen observer of plant life, will notice more and more as he progresses the many peculiarities of plants. The strangest thing about this fascinating work to me is, that the more deeply we go into it, the more our own weak points are brought home to us. Gardening is one of the oldest professions in existence, and no matter how proficient one may be there is always much more to learn about it. To an outsider it may seem strange that one can follow a certain line year after year, and after spending a lifetime in the work, be compelled to say that there are details which have not yet been thoroughly mastered or fully understood. When we notice any improvements we feel as if the road ahead was clear, but when reverses come an unfathomable mystery seems to hang over our work. Seasons vary. We rarely get two in succession that are alike. It is true that we have a glass roof over our trees; but we cannot always give them the exact climatic conditions that they want. If there is a deficiency of sun when a certain lot of fruit is ripening, they are sure to suffer for the lack of it. This is more apparent in a house of Grapes when they are starting to color than in orchardhouse fruit.

It is the same with fruit grown in the field or garden. It is much finer in color and size and, above all, in flavor, in some seasons than in others. I do not mean to imply that fruit grown under glass will vary to the same extent as fruit left for Nature to take care of. Nevertheless, the proper outside climatic conditions contribute to our successes, while inclemencies bring failure. I dwell on this point, for the grower is often criticised because his fruit is a bit off flavor, or less perfect in some way than that of the previous year, although he may have given it the best attention, according to his skill and judgment. But he should not become discouraged if a crop falls short once in a while. There is this to be said in favor of the orchardhouse method of producing fruit, that a good crop every year is assured.

In my list of the fruit best adapted to the orchardhouse work, I shall select only the choicest varieties, adding a few words as to the most reliable kinds.

PLUM OULLIN'S GOLDEN

A very large variety. Requires more thinning than some of the other kinds; otherwise the full size will not be obtained, nor will the flavor be so rich

The Peach and the Nectarine stand out pre-eminent, and get first place, as being admirably adapted for growing in pots or tubs. If both early and late varieties are selected, ripe fruit may be had for several weeks, even in one house only. Nectarines should find more favor than Peaches, as many of them have a distinct flavor. But both Peaches and Nectarines have a decidedly rich flavor when grown in tubs, and give a never-failing crop from year to year, which is a recommendation worthy of note. All varieties may be grown in tubs, still there are a few that may be a little more difficult to keep in a symmetrical form, on account of their habit. Each kind has its own peculiar character. Some varieties will produce wood buds more freely than others, and these are the desirable ones, especially if the tree is to be kept in pyramid form. It is absolutely necessary here to prune at the wood bud. The Bellegarde, for instance, will at times be found shy in wood buds—so much so that the terminal growth cannot be shortened. Any tree that shows sparingly in wood buds may be grown more successfully in bush form. There are not many that exhibit this deficiency, but we have, on the contrary, more than we need.

Pears come next on our list. They have been cultivated successfully now for many years in the orchardhouse, and their merit is fully recognized. It has, in fact, been admitted time and again that Pears are improved to a wonderful degree with indoor treatment. Many an exhibition table has been graced with noble specimens from the orchardhouse, that for size, perfect shape and combination of rich color and finish it would be impossible to produce in outdoor grown fruit. The habit of the tree is, moreover, ideal for the purpose. It makes a splendid pyramid and can be kept in good form with very little work. A good average crop can be had from year to year, and the tree will keep in a healthy, vigorous condition for a long time. There are quite a number of varieties that can be recommended for the purpose. Some are much richer in

flavor than others. Both Beurre Hardy and Conference have a richness of flavor that cannot fail to please the lover of Pears. Where a few extra large specimens are desired, Pitmaston Duchess and Souv. de Congress will produce single fruit weighing from one to one and one-half pounds, if the tree is thinned with that object in view. Our orchardhouses are ideal for producing perfect specimens, and these pyramid trees loaded with fruit are a pleasing sight to look upon. Therefore, I unhesitatingly place the Pear next to the Peach and Nectarine for orchardhouse work. With good treatment they will give an average crop every year.

Plums are third in order. While they do not present such an imposing sight as the Pear, yet they will enrich the collection and help to make the fruithouse more attractive. Plums are a valuable addition as a dessert fruit, both as to richness of flavor and handsome appearance. Table Plums chiefly should be grown in the orchardhouse. Allow them to get perfectly ripe before gathering, and you have a very rich fruit worthy of gracing any table. Plums, however, have their peculiarities, which are difficult to explain. In the first place, they must be finished to perfection, in order to be rightly appreciated, and this means that the tree should not receive any check during the season of maturity. If Plum trees, just as the fruit begins to ripen, are placed outside, with a wire screen as a protection from the birds, they will finish up much more satisfactorily than in the house. It is probable that the natural dews at night are beneficial to the fruit at that stage of ripening. This may seem a curious argument and it may be said that if such is the case, the trees might be left outside altogether. To this I reply that the fruit will be much finer if left inside until it starts to ripen. I strongly recommend this mode of treatment for a good Plum crop, for if they are put outside a sheltered location is necessary. It has happened to me more than once that one-half of a crop would ripen on a tree of the earliest kind, while the rest would absolutely refuse to soften. But if I set them outside at this stage, the difficulty would seem to be overcome.

PLUM MALLARD

The Mallard Plum is a robust grower and is valuable for its earliness and rich qualities

I suggest that the skeptical give this method a trial, by taking one half of their trees outside and leaving the other half in the house. It will probably not take more than a year to convince anyone of the decided benefit to be derived from my method.

There is a splendid variety of material to select from. Oullin's Golden, Denniston's Superb, Mallard, and others are a veritable dessert luxury.

Cherries grown in pots or tubs in our climate are more often a failure than a success. From my experience I am compelled to place them on the doubtful list, because of the uncertainty of their crop. I have experimented considerably with them at different times, allowing the trees a certain amount of frost, and also testing them by the non-freezing method, in the hope of having assured

PLUM CZAR

A very early purple Plum; tree a free cropper. May be relied on to give good satisfaction when grown inside

crops. If they were not a failure, I at least did not have the desired success. So taking everything into consideration, I cannot recommend fruit about which the uncertainty is so great. While I regret this, I must advise according to my experience. The American grower, as a rule, wants to handle varieties with which he feels reasonably sure of success. If I could recommend the Cherry with the same confidence as the Peach or Nectarine, I would say, by all means add Cherries to your list of orchardhouse fruit. The tree itself is of excellent constitution, and may be kept in vigorous health for many years, and the crop would naturally have advantages over some others, for the early Cherries mature ahead of most other fruit. The Cherry tree produces an abundance of fruit blossoms, but our extremely hot sun occasionally seems too much for them, and generally the bulk of the blossoms drop off, or at least fall before stoning. If you are anxious to secure a good crop and have enough trees to make it worth while, put shades on the house, just heavy enough to break the strong rays of the sun, and they may be rolled up when the sun begins to lose

its strength. This shading will be the most beneficial when the fruit is setting, and again when stoning. Do not feed much until the fruit is stoned.

Apricots have been grown successfully under glass for many years. In the open field or garden the trees will bloom when the temperature is comparatively low; therefore success will be more certain inside if they can be brought along gently. They set freely, but the size of the fruit is apt to be discouraging. I can attribute this only to premature ripening. While the tree may have been brought along in a moderate temperature until the fruit is all set, the extremely

PEAR PITMASTON DUCHESS

This is a very large Pear; it is not uncommon to have specimens weighing 1¾ lbs. and over

high temperature with which we have to contend at times is decidedly against it, and this I believe is one of the causes of ripening before the desired size is reached. The Apricot will undoubtedly thrive better in a more even, moist climate. I well remember seeing many years ago a crop of Apricots on an open wall in the north of Scotland. The trees were absolutely loaded with fine, rich, juicy fruit. When I compare such specimens with the results of our efforts here, I must admit, regretfully, that we cannot produce their equal in our scorching Summers. But better results will be obtained in the orchardhouse than by open air culture. That means, of course, in the northern States. If atmos-

PEAR CONFERENCE

Experience has taught me that Conference Pear is one of the richest table Pears that we have, although the fruit is not so imposing as some of the other varieties

pheric conditions of these States were agreeable to the best development of the Apricots, we should see them growing freely and producing a bountiful crop, particularly as they ripen in advance of the Peach. While we may see the Apricot tree growing luxuriantly, it is minus its important part, the fruit, or at least a satisfactory crop. The failure of the Apricot has been attributed to early blossoming, combined with Spring frosts, by which considerable damage is done. If a stock can be secured for budding the Apricot on, that will withstand our extremes of heat and cold, there may be a partial success with this choice fruit. Heavy crops of it are produced annually in the more temperate climate of California. I should like to give as good a recommendation to the Apricot as I can to the Peach and the Nectarine, the Pear and the Plum, but I cannot do so conscientiously, as the facts are against it.

Figs are admirably adapted for growing in pots and tubs. Their tendency to rank growth may be overcome in a measure by the close confinement, which produces a firmer growth, and this means a greater abundance of fruit. Where Figs are a specialty, however, better results may be obtained by treating them in a compartment of their own. As they produce two crops during the season, their requirements can be better attended to apart from the other fruit, as I shall explain later. I will add here merely, that Figs, when handled properly, are much appreciated as a dessert fruit.

Apples for the orchardhouse offer a great number of varieties that can be depended upon for good crops year after year. Some years ago I had many varieties under my charge, that were admired for the perfect shape of their large fruit. Apples grown under glass are an imposing sight, and the little trees

loaded down with their massive fruit are sure to attract attention. But, as I have said, the outdoor conditions here are so favorable for the perfect development of this fruit that I can only look upon the orchardhouse product as more of a curiosity than anything else.

While the Apple responds excellently to this confined treatment, still the dessert or table varieties should be cultivated chiefly. But we cannot pass by such noble specimens as Gascoyne Scarlet, Peasgood's Nonsuch, Lady Henniker or Gloria Mundi. These have stood out prominently for many years, especially in exhibits of orchardhouse fruit. They will outclass the open-air fruit for high color, size and finish, particularly if they can be ripened up in a cool, airy house, or be placed outside, with the treatment recommended for the Plum; this will intensify their color after they are fully grown.

I have passed in review the different kinds of fruit, not with the view to finding fault with any, but for the purpose of indicating those that are the most reliable, together with the weak points that I have noted during my many years of handling them. I now leave the grower to choose for himself.

The following lists are condensed, for I have left out many that might also be grown in the orchardhouse. Those that I give, however, will be found sufficient for all practical purposes and will not confuse with a multiplicity of names. The different kinds follow about in the order of their ripening.

PEACHES

Duchess of Cornwall
Duke of York
Early Rivers
Peregrine
Dr. Hogg
Alexandria Noblesse
Goshawk
Exquisite
Princess of Wales
Thomas Rivers
*Mountain Rose
*Foster
*Early Crawford
*Late Crawford

NECTARINES

Early Rivers
Advance
Lord Napier
Elruge
Stanwick Elruge
Byron
Chaucer
Newton
Spencer
Victoria

PEARS

Bartlett
Souv. de Congress
Madame Treyve
Beurre Hardy
Fondante d' Automne
Louise Bonne de Jersey
Gansel Bergamot
Conseiller de la Cour
Conference
Magnet
Pitmaston Duchess
Doyenne du Comice
Durondeau
Princess
Beurre Diel

PLUMS

The Czar
Early Transparent Gage
Oullin's Golden Gage
Mallard
Denniston Superb
McLaughlin's Gage
Green Gage
Belgian Purple
Bryanston Gage
Transparent Gage
Late Transparent Gage
Golden Transparent
Reine Claude de Bavay
Grand Duke

CHERRIES

May Duke
Early Rivers
Frogmore Bigarreau
Reine Hortense
Emperor Francis
Napoleon Bigarreau

FIGS

Bourjassotte Grise
Brown Turkey
Black Marseilles
Early Violet
Negro Largo
Violet Sepor

APRICOTS

Large Early
Royal
Moore Park
Peach

APPLES

*Mr. Gladstone
*Beauty of Bath
*Lady Sudeley
*Red Astrachan
*William's Favorite
*Benoni
†Thomas Rivers
†Yorkshire Beauty
*Mother
*Washington
*Ribston Pippin
†Peasgood's Nonsuch
*Cox's Orange Pippin
*King of the Pippins
Gascoyne Scarlet
*Melon Apple
*Mannington's Pearmain
*King of Tompkins Co.
Belle de Pontoise
Reinette du Canada

*American Varieties

*For the table
†For the kitchen
For kitchen or table

CHAPTER XXV

FIG CULTURE IN A SEPARATE HOUSE

Planting and General Treatment—Preparations for the Second Crop—Feeding—Gathering the Fruit—Pruning and Training—Varieties Best Suited for Forcing

THE Fig tree is an interesting tree to grow under glass. While it may be grown with fair success in the orchardhouse among other fruit, it will thrive much better in a house by itself, or, properly speaking, in a fighouse. The origin of the Fig, like that of many other plants, is obscure, but we do know that it was cultivated in very ancient times. It is probably one of the very oldest cultivated fruit trees that we have. Ancient though it be, the luscious fruit is still a favorite with many, both fresh and dried.

There is something majestic about the Fig tree, which is entirely different from any other fruit tree. The interesting make-up of both wood and foliage is apparent at once; also its different mode of fruit-bearing. Both the wood and foliage are highly ornamental in themselves; but they are as nothing compared with the luscious, ripe fruit that follows, not in one crop but in two, with at times even a third crop in the same season. There is no other tree that can compare with it in fruitfulness.

California realized the possibilities of the Fig tree many years ago, and with an ideal climate for its successful culture, there are now thousands of acres under cultivation there, the yield from which must be enormous.

One thing to be said in favor of Fig culture under glass is, that the tree is comparatively free from fungous diseases and from insects, with the exception of mealy bug, which will thrive wonderfully if once allowed a foothold; for the fighouse should be maintained in a fairly moist, humid atmosphere while developing its crop, and this favors the rapid spread of the bug.

The Fig is easy to propagate. There are different methods of producing young stock, namely, by seed, cuttings, layers and suckers. Seed, however, is not often resorted to, unless it be with a view to improving or increasing certain kinds that are found to succeed best. The best way to raise seedling Figs is to select the finest fruits, allow them to get thoroughly ripe, and then separate the pulp from the seed. When dried out it may be sown at once, or held until about January and sown in heat, growing the seedlings along without a check.

Figs will make a rapid growth either from seed or cuttings. Cuttings are selected from ripened wood of the previous year's growth, short-jointed wood being preferable. The cuttings may be made in the Fall, heeled into soil in a cool house for about a month, when they may be brought into heat. A propagating house is all right, where the bottom heat is stronger than the top; a place suitable for rooting Roses will answer for Figs. While the Fig tree has a very strong constitution, its wood is comparatively soft, and one might think that its make-up indicated a short duration. But such is not the case. The Fig may be counted upon to last for many years, for there is no insect life to bother either foliage or roots. Imperfect drainage probably affects the health and vigor of the tree more than anything else. While it loves an abundance of moisture during its growing season, yet perfect drainage is absolutely necessary. Two things should be borne in mind which are of importance in preparing a border for Figs, namely, perfect drainage and confining the roots to a limited space. If they are allowed to ramble at will, the trees will make an over-abundance of wood, with a poor showing of fruit.

The Fig has many peculiarities, all of which are interesting. Its mode of bearing fruit puts it in a class by itself, as it is different from that of any other fruit tree I know. It has been thought that the Fig tree bears fruit without first producing any blossoms; but this assumption is incorrect. The blossoms are there, but they are invisible, or rather, inside of a fleshy receptacle, out of which the fig is formed. These blossoms may be considered very fertile, to judge from the quantities of seed produced by a single fruit.

The Fig will grow luxuriantly in almost any style of house with an abundance of light and sun. No very large structure is required, as a rule, to supply the needs of a private establishment. I have seen excellent results obtained from an even span, a three-quarter span or a leanto. It is immaterial which of these is used, but whatever kind is selected for the fighouse, it must have full exposure to the sun. The tree may be trained into any desired shape suitable to the structure, but it must have liberal headroom, for the simple reason that Figs do not take kindly to severe pruning; which causes rankness of growth and should not be encouraged. The best time for thinning or regulating the branches is when they are making their growth, and this can be accomplished by disbudding and pinching the young wood, as I will explain later.

While Figs will grow and flourish in a tropical climate, yet a house intended for their culture would not be perfect without an abundance of ventilation both top and bottom, though the bottom ventilation will not be used until the crop is ripening, when a crack of bottom air is of decided benefit. When the last crop of fruit is gathered toward the Fall, the bottom vents will do their work in firming or ripening up the wood. Though the wood is soft in nature, yet the bottom air treatment in the Fall, and away into the Winter, even to ten degrees of frost, will greatly benefit the tree.

In preparing the border, the first essential is good drainage. It is also well to confine the roots strictly to a given space, for if they are given any outlet, there is no telling how far they will travel. A border six feet wide with soil two and one-half feet deep will support trees for many years, with system in

feeding, giving top dressing, etc. The Fig is not particular as to soil, and this certainly need not be made too rich, otherwise too rank a growth will be sure to follow. A good loam, similar to that recommended for Peaches and Nectarines, is about right, and an added sprinkling of coarse bone is all that will be required. As the trees get thoroughly established and the border is filled with roots, surface feeding can be applied to good advantage, according to conditions. If the trees have a tendency to rankness, less feeding will be required. From my experience I cannot lay down any cut and dried rules. Feed according to the nature or the requirements of your trees. We all know that the same quantity of fruit cannot be obtained from an over-rank growth as from medium, short-jointed wood. The feeding recommended for Peaches and Nectarines will also do for Figs. But I repeat that good drainage is one of the chief factors of success. With systematic feeding, I have seen wonderful crops of Figs taken from houses where the roots were confined to a comparatively small amount of soil.

If a fighouse is started the 1st of February at a temperature of 50° at night and 60° to 65° by day, gradually increasing to 65° by night and 75° by day or 80° with sun heat, ripe Figs may be had about the first or second week in May. When the requirements of this fruit are once fully understood, it is not difficult to raise successful crops year after year, for the trees are of a hardy, robust constitution. Still a crop may be seriously damaged within a short time. For instance, just as the fruit begins to ripen, a dry, bracing atmosphere must be maintained, with no spraying of the trees while the crop is in its ripening stage. The skin of the fruit is so tender, that too much moisture would produce mould, which is the starting point of decay. A drier atmosphere is also necessary in order to get the desired rich, luscious flavor.

When the first crop is gathered spraying and moisture can be more freely given, until the second crop is ripe. It is easy to see from this mode of treatment that it is of decided advantage to have Figs in a house where they can be treated according to their own peculiar requirements. Simple though these be, it would be impossible to satisfy them in a mixed house.

PLANTING AND GENERAL TREATMENT

The Fig tree will begin to bear while it is still quite small, or the second season after planting. The greatest obstacle to success is probably the crowding of too many trees into a house. Young trees may be planted six or seven feet apart; this distance will do for three or four years, or until they begin to crowd into each other. It is then better to remove every other tree rather than to resort to much pruning. It is well to have this exigency in mind in first planting a house, and to arrange that the permanent trees shall be about fifteen feet apart. This will allow the proper expansion of the branches on each side of the main stem. After spacing the permanent trees, the supplementary ones may be set in between, with a view to removing them when the space is needed.

Young stock for planting is as a rule pot grown. Therefore all roots must

Fig Bourjassotte Grise

A Fig branch in fruit, showing two crops. The two large figs are just ripe, while the three smaller ones have not long been formed

be disentangled and straightened, or spread over the border. They should not be set out just as they come from the pot, for freer root action will be obtained by relieving the roots around the ball, and spreading them about as much as possible. This little preliminary work will promote a more satisfactory growth in every respect. It is necessary at times to root-prune the Fig tree, after it has been in the soil for two or three years and makes an extra strong growth, with a poor showing of fruit.

Root-pruning is a simple operation. Dig a trench around the tree about two feet from the butt; this will encourage more fibrous roots, and these roots again will encourage growth that will produce fruiting wood. The long, rank, coarse roots are anything but desirable, as they produce only rank, fruitless wood.

The nature and make-up of the Fig are entirely different from those of any other fruit. While its cultivation is simple to the man who understands its needs, my object here is to give such instructions that the amateur grower who follows them can make a success of Fig culture. The key to success is interest, and when that has been awakened it is soon followed by enthusiasm for the work, which will abide for all time.

The Fig is good for two crops at least, and if the house has been started on the first of January, three crops may be gathered during the season. The first crop, however, is procured from the previous year's growth, if we are through forcing by the end of September, and the house is thrown open to ripen up the wood for the following season. Sometimes quite a number of small green Figs appear on the young wood; when these are large enough to be detected or begin to take their shape, they should all be removed, which can be best done with the finger and thumb. If this green fruit is allowed to stay on it will drop off, instead of swelling or maturing, when the trees are started up in the Spring, whereas if it is removed in the early Fall, the tree will have sufficient time to exert its powers in the seasonable preparation of new Figs for the following year. If the operation is undertaken in time, new Figs will form before the Winter sets in. Sometimes two Figs will form in place of one rubbed off.

PREPARATIONS FOR THE SECOND CROP

Soon after the heat is turned on in the Spring, growth and the first crop will start at the same time. Figs will appear on the previous year's wood as the new growth progresses; these should be pinched in due time, from six to nine inches, according to space. This will check the flow of sap, which causes the wood to firm up and will produce fruit from the axils of the young leaves. In a short time wood growth will commence again, and this may be pinched again as recommended for the second crop. Usually there are more young shoots starting than are necessary. Any shoots not needed should be disbudded or pinched back close to the old wood. While it is well to have the tree furnished with foliage, this should not be at the expense of crowding. Any wood that has been growing during the Summer in a crowded condition cannot be expected to give satisfactory results the following season. Success, moreover,

is more certain if all the shoots can be kept in equal vigor. Any shoots that appear to be advancing unduly or taking the lead should be pinched. This will be a check and will divert some of the sap into other channels. An equal distribution of the sap is beneficial in various ways; there will be a disposition to produce fruit that will be less liable to drop off. With any irregularity of growth the flow of sap also will be irregular, and this is sometimes the first reason of fruit dropping before it is ripe. Equalization of the sap is one of the secrets of successful Fig culture. But with care and close attention to details this may be accomplished without much difficulty.

The Fig leaf will absorb large quantities of moisture, and a moist, humid atmosphere is therefore good for the tree, except when the fruit is ripening, at which time a fairly dry, bracing atmosphere must be maintained.

By arranging the Summer's growth, disbudding all surplus shoots, that are not required to furnish the tree, the Winter's pruning will not be a great work. As it is the nature of the Fig tree to produce rank growth, severe Winter pruning would only increase or encourage the trouble. Better success may undoubtedly be had with good headroom and space for the trees to expand. While I advocate as little pruning as possible, still it would be useless to tie in the wood to an extreme degree; the foliage is very massive and requires space for perfect development.

FEEDING

When first making a border, very rich compost would be a serious mistake, as I have already said. When the roots are strictly confined to a given space—as they should be for best results—it will be found after a few years that the border is matted with working roots, if everything has progressed favorably. Then a top dressing will be of great assistance in starting them on their season's work. This dressing may be in the proportion of two of soil to one of manure. Bone meal, wood ashes and Thomson's manure are all good for bringing the crop to its highest state of perfection. Bone is best applied with the top dressing. A light application of Thomson's manure or wood ashes may be made whenever the border requires water. But in using any high grade fertilizer, like Thomson's manure, it is always best to water the border first; then add the fertilizer, mixed with six or seven parts of soil, and always give a light watering after applying the fertilizer. Directions always go with the bag. Two or three applications of this manure may be given during the season if the trees are making normal growth and are producing liberal crops. I have tested many different grades of fertilizers and have obtained the best results by the use of Thomson's vine and plant manure. Hence the strong recommendation. It is especially good for all kinds of indoor fruit. It has stood the test of many years, always with gratifying results when properly handled. We are living in a progressive age and during recent years the manufacturers of fertilizers have given their best thoughts to the question of turning out high grade, complete manures, knowing full well that the grower is ever on the alert for an article that will help him to bring about best results. High grade manures are naturally more expensive, or seem to be, than low grade ones, but if the

grower considers the results that may be obtained by use of the best material, and that a smaller quantity is required for building up both foliage and fruit to the highest state of perfection, he will always select the high grade article, at least for indoor fruit.

Bon Arbor is also a wonderful plant invigorator. If a plant is a bit off color in foliage, while the roots are in an active, healthy condition, one watering with Bon Arbor given as directed will produce good results within a few days, bringing back that deep, green lustre so desirable. It also is a complete, high grade manure, and is pretty well known, I believe, throughout the country, being used by the majority of up-to-date fruit and flower growers. The manufacturers of this manure have received many testimonials from all parts of the country as to its standard qualities, and the benefits derived therefrom.

Clark's Fertilizer is one of the old, high grade manures, and as popular as ever. During the last twenty years it has made many friends throughout this country. A more recent introduction that has gained popularity is Ichthemic Guano. It is admirably adapted for all indoor fruit. A good indication of its efficacy is given by the plant itself, when a top dressing is applied, the roots will come in an astonishingly short time, which shows clearly that the ingredients contained in the guano are decidedly agreeable to fruit trees.

There are many other brands of fertilizers that are excellent for different crops. In all the high grade fertilizers put on the market today the ingredients are indicated, and the analyses show the percentage of their constituent elements.

GATHERING THE FRUIT

In the gathering of the fruit the Fig again differs somewhat from all other fruit, in that the flavor is decidedly improved by allowing it to remain on the tree until it is most ripe, or almost on the point of shriveling up. In order to bring it to this state, a decidedly dry atmosphere must be maintained throughout the ripening process, or decay will follow. Neither can the rich, luscious flavor be obtained otherwise. A Fig picked when under-ripe is absolutely tasteless.

PRUNING AND TRAINING

Although the Fig tree must not be subjected to severe pruning, yet a certain amount of pruning cannot be avoided. We may have used good judgment in regard to pinching and disbudding through the season of growth, but when the time comes around for cleaning and tying up preparatory to another start, the chances are that there is more wood than is necessary to furnish the tree, and it is better to cut this out than to crowd in an unnecessary lot. Sometimes it is advisable to cut a branch clean away, so as to give more room to the others, but it should be borne in mind that the last growth which has been made is the growth we depend upon for our first crop in the Spring.

The Fig tree may be trained either horizontally or in fan shape, as best suits the grower. I recommend the fan for training; but the man in charge

of the operation should be the best judge. The aim in this operation is to encourage an even distribution of growth all over the tree. For instance, if, in cutting away a shoot or branch a growth is needed at the base of this shoot, prune to one or two eyes; then in time those eyes will start into growth and furnish the necessary shoots. But if no future shoot is required, it is best to cut back to the main wood, leaving no eyes for a further growth. It is usually advisable to encourage back growths, with a view to having an even distribution of foliage, for this means an even distribution of sap, which is a very important factor in the successful cultivation of Figs. It is well for the beginner to bear this in mind whenever training a Fig tree. Try to cultivate or train an evenly-balanced tree. Pinch back any shoots that are taking the lead noticeably, for by doing this the sap will be more fully equalized throughout the tree.

Attention to these small details at the beginning of training will make the subsequent operations simpler. The same applies to the tying in of the young growth. When tying the shoots before starting, allowance should be made for expansion. The wood will grow considerably, even in one season. I have known serious damage to be done through securing the wood too tightly to the trellis, or allowing the string to cut into the wood as it expands.

VARIETIES BEST SUITED FOR FORCING

There is a long list of varieties that could be recommended. I have selected what I consider the best and most reliable for forcing purposes. My list will be found sufficient for all practical purposes.

Bourjassotte Grise	Pingo de Mel
Brown Turkey	Ronde Violette Hative
Brown Ischia	Violette Sepot
Early Violet	White Marseilles
Negro Largo	Black Marseilles

Fig Negro Largo.

This variety has stood the forcing test for many years, and still holds a high position as a forcing fruit.

CHAPTER XXVI

MELON-GROWING IN THE HOUSE

Soil—Raising Young Plants

RIPE Melons are eagerly sought as a table luxury, whether grown on the farm or under glass, probably because there is no fruit more healthful to the human system. For two or three months of the year the markets are usually well supplied with the outdoor Melons. The earliest come from the South, while the Northern-grown fruit finishes up the season. Our Southern States have an ideal climate for the production of high-flavored Melons; Colorado also sends her full quota of Rocky Fords, which are grown better there than in any other State. A Rocky Ford grown in New York or New Jersey cannot compare with the Colorado product. This shows plainly enough that soil combined with climatic conditions has a wonderful effect on the make-up of the different fruits, in regard to quality, richness of flavor, etc. It is, however, not my intention to discuss outdoor Melon culture here, more important though it may be than my subject proper, the cultivation of Melons under glass.

In producing Melons artificially, there is the satisfaction of having them out of season, or when there are none in the market, at which time they will be all the more appreciated. In a private establishment with a house suitable for the purpose, ripe Melons may be had for Christmas. We have here an advantage over our brother gardeners across the Atlantic, in getting much more sunlight for our fruit, for Melons will not thrive without a fair amount of sun. They have been cultivated for centuries both in the open and under glass. We learn from early history that the Melon flourished and was abundant in Persia, growing on the plains of Ispahan, and it is said to have been of excellent finish and flavor—so much so as to attract the attention of the missionaries, who then brought the seed to Rome. It was introduced into France about 1495, and brought later to England. But here it was probably not grown with much success until glass houses came into vogue. From that time on, however, it has been improved to a wonderful degree, by careful selection and systematic cross-fertilization. Within my time even the varieties that were leaders some thirty years ago, such as Colston Basset, Victory of Bath, Gilbert's Green Flesh, Beechwood, Bromham Hall, and a few others, equally well known then, have passed. As with most other fruit, here also the hybridizers have been steadily improving upon the varieties year after year.

It is not difficult to obtain different forms of Melons. In a mixed house of fruit, or where there are three or four varieties together, and especially in the Summer when the bees are busy, there will certainly be a haphazard mixture. But where improvements of any pretension have been made, cross-fertilization has been carried out systematically and records have been kept of the parentage. The one firm which has perhaps done the most valuable work in sending out new varieties remarkable for size, vigor and rich flavor, is that of Sutton and Sons, of Reading, England. It has been engaged in this work for many years and its introductions are widely known, in this country also, and appreciated both for their strong, robust constitution and free setting qualities.

It is not uncommon for a promising seedling to spring up here and there from time to time. Some of these new varieties may prove successful, but it is well to give any seedling that is put on the market a preliminary trial, and if it stands the test and is an improvement on the varieties already on hand, the grower can only gain by including it in his assortment. Moreover, it is interesting to give anything new a test, even if it is to be cast aside when it does not fulfill expectations. All growers will agree with me when I say, that a new fruit is watched with a careful eye from the time that the seed is put into the earth until the period of maturity.

Melons will thrive in different kinds of houses. As a Summer crop they are not very exacting, providing there is plenty of sunlight. It takes less skill to produce a satisfactory crop during the long days of the Summer, than it does toward the Fall and in the Winter months. Melons are one of the most exacting of crops during the short days, requiring a fairly steady temperature both night and day. A check of any kind means ruination to the crop. This, in fact, holds good Winter and Summer, but as the latter crop is grown under more natural conditions, with no artificial heat, and only the sun's rays on the glass, it naturally is not so liable to get chilled.

Indoor Melons are becoming very popular among the wealthy, and the glass area devoted to their culture is much greater now than it was even a few years ago. Where this fruit is grown to the highest state of perfection the demand for it is always keen, but if it is of poor finish it may go begging. So it rests in the last instance with us growers whether the Melon is in demand or not. We often find fault with a certain variety for its lack of flavor, when it very probably is due to our own bad management. I know this from practical experience. Yet some varieties unquestionably have a much richer flavor than others, and it may also happen that certain kinds can be grown successfully in one locality, while they may be a failure in another. We very often find, in going around among the different growers, that each will favor different varieties. Soil and location are no doubt responsible to a certain extent for such preferences. The same also holds good for outdoor Melons. The best thing to do, in making a selection, is to test a number of varieties, and then choose the most satisfactory doers on our own particular ground.

Three or four years ago, when Sutton's Emerald Gem was sent out, I gave it a trial. With me it would grow from eight to ten pounds per fruit, fine look-

MUSKMELON, SUTTON'S EMERALD GEM

This picture gives an idea of the wonderful vigor and strong growing qualities of Sutton's Emerald Gem, the Melons weighing over 10 lbs. apiece

ing specimens, but unfortunately with a decidedly watery flavor, so that I had to discard it.

Melons may be grown successfully in almost any style of house, as I have said, for a few months in the Summer; but when they are to be grown both Winter and Summer, it is well to secure the best house for the purpose. It is not necessary to have a very large house, but a span roof is the best. I have seen good fruit produced in an even span running east and west, but an even span running north and south is much better, as the vines will then get more even sunlight. A house about twelve to fourteen feet wide is sufficient; this will give the vines head room enough, training them to trellis up each side. A comparatively small house will be found advantageous in cold weather. A very high house would not be advisable, as we have to maintain a minimum temperature of not less than 70°. Occasionally, a visitor not acquainted with the forcing process, on being taken through a melonhouse, has expressed surprise to see the vines trained on trellises about fifteen inches from the glass, which seems contrary to their natural trailing habits. But in growing fruit artificially, methods must be adopted that will lead to success. As Melon foliage evaporates considerable moisture, whether grown in the open air or under glass, the forcing house will be charged with considerable humidity, and the foliage will therefore reabsorb more. If the vines were allowed to trail inside, as they do in their natural state outside, they would decay before the crop was half ripe.

SOIL.

Good soil is one of the chief requirements for success in Melon culture under glass. With poor soil success is very uncertain. It is inviting failure to attempt to grow this crop through the Winter with unsatisfactory soil. In the first place, the compost should be such as to allow the roots to penetrate through the soil. Keep lively root action from the time the plants are set in the bench until maturity. It is easy to recommend a certain grade of soil, but it may be very difficult to obtain the same in certain localities. A desirable compost is a fairly heavy loam from old pasture land, which is friable rather than adhesive. This sod land may be plowed about three inches deep and the sod staked in a pile a month before it is needed; it will then be in good condition for use. If manure is added, it should be done sparingly. It is not a good plan to use much farmyard manure with Melon soil, though a little may be added that is thoroughly decayed. I have also found leaf soil excellent to mix in with the compost, particularly when the soil is a bit heavy. The compost should be such as to produce a healthy root action. While there should be a fairly healthy, vigorous growth, nothing is gained by vines that are too rank. A richer top dressing may be applied after the fruit is set.

Where Melons under glass are grown on a fairly extensive scale, there should be three compartments. It will take about three months from the time the seed is sown until the fruit is ripe, that is, from Spring until Fall. During the Winter it will take longer for the crop to mature. Sometimes four months are needed, especially with much cloudy weather. Considerable time may be

saved by having young plants in four-inch or five-inch pots, ready for planting in the house again when the other crop is gathered; but the young plants should not be allowed to get pot-bound, or failure will be the result.

RAISING YOUNG PLANTS

There is no better place to germinate the seed than the Melon house itself. Use 2-inch pots for the purpose, with a fair amount of leaf soil to encourage quick root action. Fill the pots about three parts full of soil and press moderately firm; then place a couple of seeds in each pot and cover with one-half inch of soil. Should both seeds germinate, pull one out. If the pots are set in a close, dark place the seed will germinate more readily. There being very little evaporation not much water is needed. An ordinary flat is good for the purpose; set the pots close together, cover with glass and keep dark with paper or cardboard. If Melon seed gets too much water before germination, part of it is liable to perish.

When the seedlings show signs of growth, remove to full light near the glass. Try to induce a stocky, healthy growth as the plant gets rooted. Repot into three and one-half-inch pots, with somewhat heavier soil. From these pots the seedlings may be planted on the bench, or if the house is not quite ready, repot into five-inch pots. Success or failure in fruiting thrifty young stock depends very largely on the condition of the plants when set or planted in the bench. This is one of the main considerations in all plant life, but while other stock that has received a check may sometimes be brought around to yield fair results, the Melon is a stubborn plant; if it has received a set-back in any way, the progress will be slow and the results very unsatisfactory. Therefore, only vigorous, healthy young plants should be set out. I have planted them on the bench out of two-inch pots, but I prefer setting out stronger plants; these will quickly start to root through the new soil, and make rapid progress.

MUSKMELON, TURNER'S SEEDLING

This handsome Melon was raised some few years ago by me. A green-fleshed Melon, rich flavor, with small seed cavity and deep fleshed

CHAPTER XXVII

MELONS—GENERAL CULTURE

Planting—Setting the Fruit—Watering—Feeding—Gathering the Fruit Insects and Mildew—Varieties

PLANTING

A LARGE body of soil is not necessary for producing a good crop of Melons. It may also vary according to the season. In the Winter the roots should be confined to a rather small space. At this season much skill, care and close watchfulness are required for satisfactory results, for the Melon is most exacting at this time.

While ripe Melons may be had through the Winter, yet I do not deny that it is difficult occasionally to secure the desired results. Having grown Melons now for several years all through the Winter, I have observed various things about them worthy of mention. When the plants are in bloom and ready for fertilizing, (all blossoms must be hand-fertilized carefully during the Winter months,) and if there is clear weather while the fruit is setting, they will set more freely and start to grow better in every respect. This also holds good during Summer cultivation, although it is decidedly more noticeable in the Winter. Therefore take advantage of clear, bright weather to set the fruit. I have also had better success by using boxes for Winter, three and one-half feet long, twelve inches wide and six inches deep, planting three vines in each box and leaving space for top dressing. If the plants are out of five-inch pots place them at equal distances, then add enough soil to form three mounds, or sufficient to cover the balls, firming the soil well around the roots, and as the roots penetrate through add more soil, except when setting the fruit, at which time no feeding or top dressing should be done.

There is yet another thing to be said in favor of boxes. As Melons must be kept near 70° at night, with 80° by day or 85° with sun, the bench tile will at times get rather warm, especially in very cold weather, but the roots in the boxes will not feel the extremely dry heat. However this may be, I find the boxes a decided improvement. In every other respect the treatment is the same as for the Summer. Guard against too much moisture around the neck of the plants, especially in a spell of dark, cloudy weather, or they will damp off. Some growers call this condition a disease, which it probably is, and brought on by

carelessness in allowing too much moisture to lodge around the necks of the plants. A batch of plants can easily be lost in this way in a few days. When a vine shows signs of damping off, place some slaked lime around its neck, mixed with some powdered charcoal.

In repotting or boxing it is important to have the new soil of the same temperature as that in which the plant has been growing. There is nothing worse than to add cold soil to the roots.

A grower desiring to produce Melons during the Winter must be quick to seize every little advantage; above all, a steady temperature must be kept night and day. During very hard firing the plants will be benefited by damping down a couple of times during the night, if there is a night fireman at hand; if not, damp down around 10 p. m. This will help the foliage, for too dry an atmosphere will cause it to dry up.

As to the usual method of planting for early Spring and during the Summer months, good Melons have been grown in six inches of soil, and also a foot deep. In fact, years ago soil from a foot to eighteen inches deep was recommended. But with the high grade of manure we now have and with our systematic feeding it is not necessary or advisable to use such a heavy bulk of soil. Fresh soil should be brought in for each crop. The best dimensions are found in a space two feet wide and six or seven inches deep; this will hold enough soil to produce an excellent crop. Set the plants in hills fifteen inches apart and train up to trellis. I prefer to set the plants rather close together, training only one main shoot to each plant. No pinching is then needed, until within six inches of the desired height, when the point may be pinched. This will cause side shoots to come away from every leaf joint. These lateral growths are what we depend on for our crop. Fruit usually shows at the first leaf, then the shoot should be pinched again one leaf beyond the first.

SETTING THE FRUIT

The Melon is dioecious, bearing male and female flowers on the same plant. The first is essential for the fertilization of the second. The male flower has three stamens united by their anthers, but the filaments are distinct. The part between the stem and base of the corolla is slender and cylindrical. The female flower is readily distinguished from the male, being altogether stouter. In the Summer, with an abundance of fresh air admitted and bees among the blossoms, the pollen may be fairly well distributed without the aid of hand fertilization. But it is not wise to depend on circumstances, as the operation does not require much time. It is well to bear in mind the number of fruit that each vine is to carry. When the plants are set fifteen inches apart, two Melons on each vine will make an excellent crop, particularly for private use, where two perfectly finished Melons will count more than four poor ones. But whatever may be the desired number on each vine, the full complement should be set on the vine at one time, otherwise the early set blossom will take the lead, while the others may refuse to swell at all. The operation is simple. In the first place, see that the pollen is perfectly dry. Then when both male and female

flowers are fully expanded, select a male blossom, strip off its corolla and invert in the female blossom. Choose a clear, bright day, if possible, and do the work around mid-day. Blossoms that are fertilized in bright sunshine will be found to swell much more rapidly and produce a decidedly better crop, if the vines are in a healthy condition; then the fruit will make quick headway. After fertilization and before the fruit gets very weighty, supports will be needed. Various contrivances have been used for this purpose. A favorite support years ago was a piece of board nine or ten inches square with a hole bored into each corner, and a piece of pliable wire secured thereto, long enough to fasten to the trellis. Another plan is to use strong raffia twisted into a sling, which will support the fruit. There is some danger, however, in these two methods, as the fruit may drop, which means a complete loss, as it then usually splits. The best and safest way is to support the fruit with nets about twelve inches square and fastened to the trellis with a sufficiently long piece of string. This is the most satisfactory support in every way and will last for years.

WATERING

Judgment is necessary in watering. Melons delight in a liberal supply of moisture, both at the roots and in the atmosphere. Spraying will therefore be in order two or three times a day in bright weather. When the firing has stopped, it is not advisable to spray the vines very late in the evening. Never close the vents tight from the time the fires are out until artificial heat is again turned on. We usually have three to three and one-half months without fire. If a house without fire heat is closed, the condensation is too great and may induce disease, or what is commonly known as black spot on the foliage. The crop should never suffer for want of water at the roots, particularly when in active growth; then a humid atmosphere should be maintained, except when fertilizing the blossoms and again when the fruit is ripening. At these periods there should be a drier atmosphere. Less moisture at the roots will then also improve the flavor. But do not allow the foliage to flag. Crops have been wholly or partially ruined by carelessness in watering. If Melons are allowed to suffer for want of water when in full growth, the root action will be considerably damaged. Soft roots like those of the Melon cannot safely withstand any extreme drying. Nor is it well to give an over-abundance of water, or to keep the soil always saturated. Give a thorough watering, then allow the soil to sweeten before applying more. This plan will maintain a healthy root action from start to finish.

FEEDING

Feeding depends to some extent on the condition of the vines. Some soils are so poor that the grower will have to depend wholly on systematic feeding and top dressing to get satisfactory results. But with a rich, retentive loam very little feeding is needed until the fruit is set. Without a robust vine it is impossible to gather fruit six and seven pounds in weight. It is therefore

well to build up the vines gradually, so that they can yield the fruit demanded of them. Several years ago I tried an experiment with a batch of Melons, growing one half wholly with the aid of cow manure, used in liquid form, which produced an exceedingly fine crop of fruit. The other half I brought along with the aid of sheep manure, but this crop was a sorry sight. I have proved to my own satisfaction more than once, that sheep manure is not agreeable to a Melon crop. I believe, however, that a change of food is beneficial to any growing crop. The main thing is to find out just what is good for certain crops. While I do not believe in carrying experiments to extremes, yet some experimenting is educational and of great benefit at times.

Top dressing is one of the best means of producing healthy, vigorous plants. Whenever a top dressing is applied, it seems to give a new lease of life to the root action, which is a fair indication that this method of applying food is agreeable. Free root action means excellent foliage, and good foliage means fine Melons.

As to the most suitable material for feeding, and the method of applying it, most growers in this country probably work along the same lines. Systematic feeding in proper quantities is most important. The crop will take a fair amount of feeding, but it will not endure gorging. It is far better to err on the light side. An overfed Melon vine acts much like a stunted one. In fact, more food than the roots can absorb will cause stagnation. Ichthemic guano, used as a top dressing, in the proportion of about twenty parts of soil to one part of guano, will produce a good growth. A top dressing of this kind should be applied just as the vine needs watering.

Nitrate of soda, in careful hands, can be used for two purposes: It will hasten maturity and increase the size of the fruit, particularly with the assistance of other food. Cow manure water may be advantageously used a few times while the fruit is swelling. A tablespoonful of nitrate of soda to three gallons of water is a safe proportion. The soil should be moderately moist when applying the soda. The best time to use this is after the fruit is set and swelling rapidly.

Clay's fertilizer has proved excellent for bringing along this crop to the highest state of perfection, with the assistance of other ingredients. Clay's is best used in a liquid form, a moderately small handful to three gallons of water. If bone is used in the compost, it should be the finest grade, or that known as bone flour.

As it takes only ten to twelve weeks from the time the plants are set in their fruiting quarters until the fruit is matured, the food must be of a quick acting nature, so that the plant will get the full benefit. I have said that I prefer a change of diet, but whatever is given, the grower should know the nature of the food and how it will agree with the development both of vine and fruit. Melons will resent anything that is not suitable to their growth more than any other fruit I know. If a mistake has been made and the vines receive a severe check, it is an up-hill proposition to revive them. Therefore, good judgment must be exercised.

I have grown excellent Melons with the aid of cow manure water alone,

MELON SUPERB

The above picture represents a Midwinter crop of Melons growing in boxes. The variety Superb is admirably adapted for Winter forcing

but the grower using the chemicals indicated will have better results in different ways. Most important of all, the flavor will be far superior to what it would be if manure water alone were used. Deficiency in flavor may be due to various causes, as lack of root action or too much moisture, both in the air and at the roots. With proper care in feeding and good root action the results should be excellent. It is not always a question of size, but when the grower can combine size with high quality the height of his ambition is realized. Still, a Melon five or six pounds in weight is sufficient for all purposes.

GATHERING THE FRUIT

Flavor may be assisted somewhat by gathering the fruit at the right stage of development. If allowed to get over-ripe, the flesh will be of a soft, musky flavor, disagreeable rather than palatable. When they finish with full vigor, Melons will ripen very quickly. Sometimes the color will change in a night; the fruit will emit a strong perfume, and it will probably also show signs of parting from the stalk; it is then in the best possible condition for gathering, though it may seem quite solid. At this stage it should be placed in a cool, airy room and kept there for a few days, according to the weather. This will allow the fruit to soften or mellow, and it will then retain its full flavor. Melons should not be kept in the refrigerator for many hours before using; this is often done with the result that the grower is blamed for a fault not his own, for Melons so treated lose in flavor.

No doubt many excellent varieties have been condemned through lack of knowledge in gathering at the proper stage of ripeness.

INSECTS AND MILDEW

The careful grower will not be troubled much with either insect life or fungous diseases. These are generally brought on by careless airing and ineffective spraying. Red spider is the most dreaded insect; if not checked it will ruin the crop in a short time, as it makes rapid headway on the soft foliage. A clean start is the best preventive for this evil. Give the house a wash-down after every crop. The pest can be eradicated by the effective use of the spray, applying it directly under the foliage with as much force as the leaves will stand. Sponging foliage of this kind is harmful.

Green fly must also be destroyed. Although it is not often troublesome, yet it may be brought about through too dry an atmosphere. Melon vines will absolutely refuse to grow when infested with green fly, for it causes the leaves to curl up and gives the vine a stunted appearance. It can be easily killed off with a light fumigation a couple of nights in succession; this is better than too strong an application at one time. As the tender leaves are easily damaged, heavy smoking is not good for them, especially in very warm Summer weather; the foliage will not stand as much then as in cold weather.

Mildew does not often attack the foliage. It is at times a bit troublesome toward the Fall. A light dusting of sulphur on the foliage, or a patch put on

the pipes when the hot water is on, will generally check its spread. If the pipes are extra hot, in a very cold spell, only a small quantity of sulphur should be placed on them, or the fumes may overcome the vines.

VARIETIES

Quite a number of varieties can be recommended highly for forcing under glass, but to keep up the standard of excellence in the selection of seed requires care and good judgment. Where there are four or five varieties in the same melonhouse, all growing together, the pollen will distribute itself over all, and we get promiscuous cross-fertilization, especially in the Summer. If this were allowed to continue for any length of time, it would result in deterioration. The only sure method for improvement is to grow each kind in a house by itself and carefully select the finest specimens, allowing the fruit intended for seed to stay on the vine until dead ripe. Melons will reproduce themselves in this way, and with careful selection the variety will improve rather than deteriorate. If a variation from the type grown is desired, the pollen from another promising variety must be secured, fertilizing the fruit intended for seed. In this way an improvement may be obtained.

In many cases, however, it is desirable to grow a mixed house, so as to secure variety for the table. A green-fleshed Melon one day and a scarlet-fleshed specimen the next is a pleasant change. It is not advisable to depend on seed from a mixed house, at least for many crops. Better procure seed from a place where it has been carefully selected true to name. You cannot expect improvement in any seed that is selected haphazard.

Melons may be divided into three classes: green flesh, scarlet flesh and white flesh. There are two or three Melons of excellent flavor in the last-named class, but, personally, I do not admire the white-fleshed sort. I consider green or scarlet flesh decidedly more inviting, though Royal Favorite and Hero of Lockinge are all that could be desired as to richness of flavor. Our American Emerald Gem has been recommended at different times for forcing purposes, and the flavor of this excellent variety is well known. The constitution of Emerald Gem is unfortunately a bit weak for forcing under glass, which makes it less desirable for a forcing Melon. The following varieties will be found satisfactory for forcing purposes:

GREEN FLESH

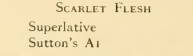
Sutton's Ringleader
Best of All
Perfection
Sutton's Emerald Gem
Windsor Castle
Turner's Seedling
Royal Jubilee
A careful selection of Emerald Gem may also be grown under glass

SCARLET FLESH

Superlative
Sutton's A1
Sutton's Scarlet
Sutton's Triumph
Sutton's Invincible

WHITE FLESH

Royal Favorite
Hero of Lockinge
Buscot Park Hero



CHAPTER XXVIII

STRAWBERRIES AS POT FRUIT

SELECTING THE RUNNERS—PROCESS OF FORCING—TEMPERATURES—FEEDING, ETC.—WATERING—GATHERING THE FRUIT

THE Strawberry has been forced successfully for many years, and most people welcome this popular fruit whether in season or out. It responds readily to the forcing process if a few necessary details are carried out and varieties are selected that are suitable for the purpose. Indeed, finer fruit may be had from pots than from open air culture. No birds or insects to mar the berries, and perfect fruit of the largest size, with pleasing color and flavor, may be grown. Strawberries under glass are not a very expensive luxury, taking everything into account. They may be brought along with other crops, with no interference whatever. They are what is called a catch crop, which I will explain later.

There are few places where greenhouse gardening is carried on to any extent, that do not grow some Strawberries. This crop is among the first of the season, and may be had with little effort from the end of February to the first of June by bringing in a batch every week or ten days. But, like all fruit under glass, thy must receive proper care. Southern berries, which appear in the market very early in the season, cannot compare with the hot-house fruit as to size and high quality. As a dessert fruit the Strawberry is popular throughout this country, though it is best known to the general public in its natural season or in its wild state. With our wonderfully varying climates in the different States, the berry season is a long one; still, there will be always room for the greenhouse fruit, particularly among the wealthy classes. It may not always pay as a money-making proposition, but it more than pays in a private establishment, for the owner will have here something that money cannot purchase, and a basket of fine Strawberries is a most acceptable present for a friend at any time. The Strawberry is a pot fruit *par excellence* in every private establishment, if grown to the highest state of perfection.

In years gone by it was thought that forced berries could not possibly be brought up to the outdoor standard, but in recent years the greenhouse production has increased rapidly and it now ranks as a very perfect fruit. To obtain this result there must be no guesswork. Give the plants the proper treatment and they will respond. One of the greatest lessons that each grower must

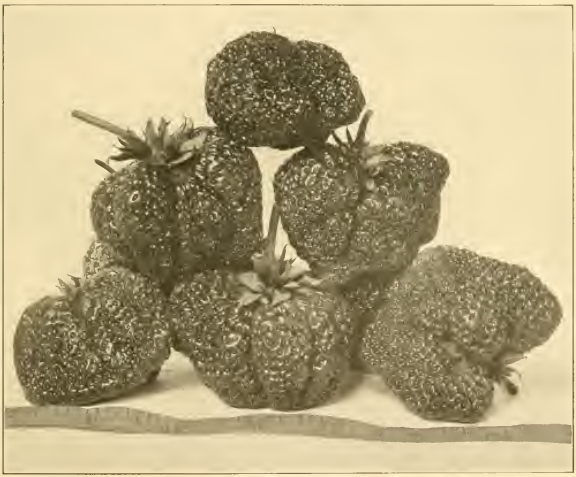
learn is to imitate natural temperatures to a certain extent; then failures will be few and the success great. We cannot expect success if on starting to force a plant we rush on too much heat before it gets acclimatized or before the root action begins. There will be no end of trouble if Strawberries are brought along in an atmosphere that is too close and humid. While good foliage is necessary both for the development of root action and for the fruit, yet if an over-abundance of foliage is encouraged by too much heat and moisture, the fruit will suffer. It will withstand a fairly brisk temperature after the fruit is set, but high temperature should be avoided before that. This may seem slow work but the crop will more than repay even if it does take a few days longer to mature. If brought along in a moderate temperature until the fruit is set and the temperature is then increased by ten degrees the rapid progress is surprising. By this method of forcing, moreover, much finer fruit will be obtained.

I have said that forced Strawberries may be had from the end of February to the first of June, but it is possible to have ripe fruit before the date first mentioned. I have had it earlier; but I have come to the conclusion that it is not worth the time and labor bestowed upon it. In the first place it seems impossible to obtain the rich flavor until toward the end of February or the first of March; besides, the premature crop is so light that quite a number of plants are required to secure a decent gathering.

Strawberries under glass do not need a special house for themselves; still, the berries cannot be ripened up on a bench. No matter what care is given to the preliminary work, success is uncertain unless suitable quarters are selected for the fruiting. This is nothing new. When I was a lad, it was my work to water the Strawberries with a watering can while standing on a ladder, for the pots were ranged on a shelf at the highest point of a leanto house within a foot or six inches of the glass. Before I was done I was usually drenched, as I had to hold the can over my head, and the water ran down my arms and body. The sensation was not a pleasant one, and no one will disagree with me when I say that my opinion of Strawberry forcing was not a high one at that time. But the methods have, fortunately, changed. The lad of today, plying a hose, with the water turned on to suit his purpose, can accomplish as much in ten minutes as I could in half an hour—and much more comfortably. It was a case of working hard and accomplishing little or nothing.

The plants must be in a position where they will receive the full sunlight and a circulation of air, particularly when in bloom and again when ripening their fruit. I have found hanging shelves admirably adapted for the development of the Strawberry. Most houses now constructed are probably of iron, and the shelves may be arranged so that the growing crops will not be damaged. All that is needed is a shelf wide enough to accommodate a six-inch pot, and if a four-inch board is nailed along each side of the shelf, there will be no accident. These shelves can be hung up in any house by means of fairly strong iron supports made to clasp around the shelves, welted together on top with a cleat turned at an angle, to fit over the cross bar or angle iron of the greenhouse. Three-quarter half-round iron is best for the purpose, and it will hold the shelf

steady. If the irons are adjusted at the proper angle the shelf will be perfectly level. With such a shelf it will not be necessary to drive a nail, and when the berry season is over the shelves can be stored away until needed again. Have the shelf irons long enough, so that the Strawberry foliage will be about six inches from the glass. The advantage of shelves of this description is that when they are removed there will be no marks to disfigure the house. They can be hung up in any house, and if they are not made too long, they will not be cumbersome to handle.



Strawberry Sharpless

This old standard variety can still be highly recommended for forcing, providing strong, healthy stock is procured

SELECTING THE RUNNERS

There are different methods of treating runners. It is very important to secure strong, thrifty ones from comparatively young plants. Good stock cannot be propagated from old, worn-out beds. Though fairly good crowns might develop out of runners from old beds, the berries will not be nearly so fine as when taken from young plants. This, of course, applies to the propagation of all plants. If one goes to the expense of growing Strawberries artifici-

ally the very best is none too good for the purpose. With careful selection of stock, berries of enormous size may be had in pots; it is therefore to the interest of the grower to procure the best he can obtain.

Select early runners so that the crowns may have time to mature and ripen up thoroughly by Fall. At times, especially in a very dry season, it may be difficult to procure early runners, unless there has been watering. If you have strong plants in two-inch pots ready for re-potting about the end of July, ample time will be allowed to grow or develop the crowns before the Winter sets in. I have found that if the plants are grown much earlier than this, split crowns may be the result. I would rather have one good crown than two or three split ones. These latter are very undesirable for forcing, especially when extra fine fruit is the aim.

Runners are generally produced in great abundance, more freely by some varieties than by others. There are two methods for increasing the stock: When the runners are large enough or begin to emit roots, fill a number of two-inch pots with soil, plunge the pot in the soil and place one runner on each pot, securing it with a stone or a peg, or anything that will hold it in place until it has rooted. The runner will often extend beyond and form another plant, but one plant to a runner is ample. If the runner shows signs of extending, pinch first beyond the plant that is layered. They should be left until the pots are filled with roots before cutting away from the mother plant. In very dry weather the pots must be kept moist or root action will be slow. Excellent plants may be obtained in this manner. In a moist season extra strong runners may be had with very little trouble.

I have also secured excellent runners by cultivating between the rows, directly after the fruit has been all gathered. Soften up the surface, then as the runners come away from the old plants, they will readily root into the soft surface, forming nice young plants in a short time if the weather is favorable. But do not allow these runners to get too firmly established, or they may receive a severe check on being taken up. Stock secured in this way should be potted up in two-inch or two and one-half-inch pots; a fairly close place is preferable until they are established in the pots. A frame is good for the purpose, with a light shade, to prevent the young plants from wilting. Gradually admit more air as they establish themselves. The main point is to establish them, but not to let the foliage flag. In a week or ten days they will be ready for a shift into larger pots. Good stock may be secured with either system, in careful hands and with attention to details.

PROCESS OF FORCING, TEMPERATURES, FEEDING, ETC.

We come now to the more fascinating work of gradually bringing the fruit along to maturity. There is nothing more interesting than to watch the steady progress of a healthy batch of Strawberries. They will throw up their dainty blossoms, that tell of Spring, while outside there may be frost and snow. In this contrast the Strawberry bloom is all the more inviting, and the fruit following is a picture to behold. When Strawberry forcing is done to any extent,

berries may be seen together at all stages of development, from those just beginning to grow to the lusciously ripe fruit.

I think the Strawberry is a valuable crop which should be included in every establishment. Even where there is no fruithouse at all, a few batches may be easily brought along in another house, where they will give equal pleasure. It is the early maturity of a crop of this nature that appeals, for it gives an extended season from the first of March to the time when the garden crop begins, if there are enough plants for the purpose. By the method that I have suggested it really costs nothing but labor. A carnation, vegetable or rosehouse can easily be made to accommodate a few shelves, hung along the cross bars with little or no damage below.

Excellent results may be had when houses with different temperatures are at command, a temperature of 45° to start with at night, with a rise of 10° in the day, or 15° with sun heat. For this stage a vegetable house where Lettuce, Cauliflower, Radishes, etc., are grown is excellent. Let the berry pots stay here until they get acclimatized, or root action begins, and the new foliage is expanding. Then a carnationhouse temperature will be agreeable, until the plants are through blooming, with the fruit set; when this is done, a rosehouse temperature may be given, or higher if necessary. If they are not subjected to any extreme heat, more air can be admitted when the fruit is ripening, and this will heighten the color, improve the flavor, and give tone to the berries, two very important factors in the make-up of a perfect berry. Without high color the flavor will be decidedly flat. With a rosehouse temperature and a free circulation of air the conditions should be perfect for both high color and rich flavor. But these are only two requirements. For poor root action there is no remedy. Fruit produced under this condition is of decidedly low grade and almost tasteless. Careless watering and poor drainage are generally the cause of sluggish root action. A too high grade manure will also cause stagnation. When Strawberry roots once become inactive, it is difficult to bring them around again.

Skill and close attention are required when bringing the plants in very early for forcing. Later in the season there is little or no difficulty in procuring a good crop, especially through April and May, for then an abundance of air may be admitted, which is agreeable to them. The first lot of plants may be brought in between the middle of December and the first of January. If they have had a fair amount of frost before forcing, they will start up soon. They should have a fair amount of foliage. When they make this growth before coming into bloom, with roots working, one application of nitrate of soda will help them and give tone to the foliage. Give it in the proportion of a tablespoonful to a three-gallon can of water. Feed no more until the fruit is set, but after this they will take a surprising amount of food to good advantage, provided there is not too strong an application at one time. It is better to feed light and often, increasing as the plant gets accustomed to the process, assuming that the roots are working. Growing berries in a six-inch pot means producing a crop under restrictions. Then if extra large berries are required, there must be systematic feeding. With

a high-grade fertilizer intelligently applied, better results may be obtained from six-inch pots than from larger ones.

There are different manures adapted to this crop. Clay's, used in a liquid form, is a manure of tried value. Ichthemic guano as a top dressing is also good, in the proportion of four or five of soil to one of Ichthemic, applied as a light surface dressing. Bon Arbor may also be used with good effects. Even cow manure water now and then will help to bring the crop along; but when the berries get large, chemicals are cleaner to use, and give the same or better results.

The first lot of plants, after being started, may be brought into heat from the middle of December to the first of January. Where a steady supply of fruit is desired, fresh plants should be brought in about every ten days, and treated as recommended for the first lot. Bring the pots in according to the stock, but the batch should always be large enough to yield two quarts or more at one gathering. This means fifty or seventy-five pots in a batch.

WATERING

Good judgment must be used in watering during the short days. When the plants are first brought in, they should be held a bit on the dry side. Increase the moisture as the growth advances. After the fruit is set it will take a liberal amount until it starts to ripen; then the plants may again be kept a little drier at the root. A better flavor will be obtained with this treatment. Nor should the plants be fed after the berries begin to ripen; but during the period of developing their fruit they may be fed twice a week with either liquid or top dressing.

GATHERING THE FRUIT

Strawberries should color up well before being gathered. If they have to be shipped a great distance it is better to pick them while they are still firm. Take the morning or late afternoon for this work, when the weather is bright. Delicate fruit like Strawberries, when sent by express, must be packed with some care. Have the berries perfectly dry. The best thing to use is the regular quart berry basket. First line the berry basket with cotton wool and wax paper; then pack in the fruit with a perfectly dry leaf of the Strawberry plant between each berry. If there is any moisture on either foliage or fruit, the latter will not reach its destination in a very tempting condition; but with dry packing it will arrive in good shape.

Setting the fruit is very important. There are no insects to perform this work early in the season. To secure a perfect set, the pollen must be dry around mid-day, and this means that water should be kept off the foliage while the berries are in bloom. Go over the flowers once a day about noon with a camel's hair brush, until a sufficient number of berries are set. If the pollen is dry, a light touch with the brush will distribute it around the pistils. Berries that are set imperfectly will not swell evenly; hence the importance of a fairly dry, bracing atmosphere while the plants are in blossom.

CHAPTER XXIX

SECRETS OF SUCCESS IN STRAWBERRY CULTURE

Soil—Potting—Watering—Growing—The Crown—Freezing and Winter Protection—Insects—Fungus—Varieties for Forcing

STRAWBERRY growers of experience well know the importance of devoting their attention to bringing up the crowns to the highest state of perfection, and the beginner should learn that herein lies the secret of success to a certain extent. The desired results in fruit produced by the forcing process are impossible unless the crowns are thoroughly ripened in the Fall. Develop as strong a crown as possible, but without overstepping the mark with rich food to the extent of splitting the crown. The Strawberry when forming the crown requires as much attention as when developing the fruit.

Soil is also an important matter to be considered. While Strawberries will thrive splendidly in the field or garden in a light, sandy soil—medium and heavy—they cannot be forced successfully in pots with such soil. A good rose soil is the best for this purpose, adding one load of manure to three loads of soil, in a more decayed state than for Roses. Most growers understand the term rose soil to mean a friable loam, a bit heavy, but not clayey.

POTTING

There is a difference of opinion as to the best method of potting. Some good growers advise to repot from two and one-half-inch pots to the fruiting six-inch pots. I have done this too in the past; but for many years I have repotted from two and one-half-inch to four-inch pots; then, when they are rooted through—they should not under any circumstances be allowed to get pot-bound—I repot into the fruiting six-inch size. By this method I get a quick and substantial growth. If the plants are repotted from two and one-half-inch into six-inch pots, with the necessary firming, the roots will take a long time in penetrating, whereas a second shift from four-inch into six-inch pots seems to stimulate the root action. My method calls for more labor, but the difference in the crop more than repays. Moreover, it has the further advantage that a stronger compost can be used in making the last shift, and the roots will thus be in condition to assimilate more food. Where labor is no object,

STRAWBERRY PRIDE OF RED BANK

Being a local production, the sterling qualities of this variety may not be so widely known as they deserve. I unhesitatingly class this as one of the very best for growing under glass

this method is undoubtedly the best. This is no theory of mine; I am speaking from practical experience. The plants will make a quick growth with strong crowns.

Perfect drainage is necessary when placing the plants in the fruiting pots. Strawberries need an abundance of water when they are developing their crowns and again when they are being forced. The surplus water must have a free outlet. If a plant is not looking happy, clogged drainage will generally be found to be the cause. I place about one inch of drainage in a six-inch pot, putting a fairly large crock in the bottom, with a sprinkling of soot, to prevent worms from working their way through and ruining the soil; the soot will also benefit the plants. The soil may be further improved by a light application of a fertilizer, especially at the last shift. But do this sparingly, for when the plants are rooted and more food seems necessary, it is an easy matter to give a watering with Clay's manure (in the proportion of a small handful to three gallons of water) or with Bon Arbor; either of these will stimulate the growth of the foliage, which should have good substance and look dark and healthy. Thomson's manure is also excellent for building up a good growth; it should be mixed with the compost, about three or four pounds to a good wheelbarrow load, for the final potting, while about half the quantity should be used when repotting from small pots in the four-inch size. Or take less of Thomson's and add a small sprinkling of wood ashes, soot and bone meal, a mixture that will produce a steady, uniform growth. Bone meal is excellent because of its lasting qualities. The quantity to apply of course depends on conditions, and each grower must consult the needs of his plants. A weak plant takes less than a strong one. The nature of the soil must also be taken into account. But the quantities I have mentioned are on the safe side.

The condition of the soil must also be noted. The compost should be moist enough to firm well, without baking. If it is in the proper friable condition there is not much danger of potting too firmly. First put some suitable material over the drainage, to prevent the finer soil from percolating through, as this would eventually clog up, in the final potting. Broken pieces of sod are best for this purpose, as it keeps the soil above in place, and benefits the roots as they strike through.

When the plants are in their fruiting pots, the best location for them is where they are sheltered from the north-east winds and receive the full sun from morning until night. They may stand pot to pot until the foliage begins to crowd, when they must be given more space; they should now be set on a bed of ashes, which is a preventive against worms. I do not approve of plunging the pots while the plants are growing, for in a prolonged wet spell they will not dry out. Although they may become dry oftener than when plunged in ashes or any other open material, yet this will not hurt them, but will rather do them good, so long as they do not suffer from want of moisture; they can be easily watered with the hose. Proper watering is one of the fundamental principles in the treatment of all plant life. The successful grower is the man who has thoroughly learned this art—when to give and when to withhold; good root action depends on this, and without such action we face defeat. With

sluggish root action feeding is of little avail, and is even hurtful, for the nutriment has to be carried up through the roots to the foliage, and from the foliage to the fruit. If the plants have been carried through the Winter in full health, they are ready to respond when called upon, and will begin to grow vigorously in a short time. Toward Fall, when the crowns are fully developed, less water will be needed, but the foliage must not be allowed to wilt.

Nature must also be allowed to do her share of the work, never forgetting the natural habits and requirements of our plants. Frost is essential to a good berry crop. I have known extra early batches to be started without any frost, drying the plants off enough to ripen and arrest growth, but this treatment is not a satisfactory one, and the crop will hardly repay the labor spent upon it. The plants will stand ten degrees of frost with benefit, if the foliage is protected against the sun's rays, and the pots against damage by the cold. Where coldframes are available, the pots can be plunged into them in a bed of coal ashes. During severe freezing cover with the sash and provide other protection, as necessary. The burying of the pots not only avoids a possible breakage by the frost, but the moist ashes around them keep the roots in a comfortable condition. When Strawberries can be carried through their dormant period without watering, the roots will be much healthier. If they are stored in a dry atmosphere, watering will probably be necessary, for it is not well to let them get over dry, even when dormant. If there is no coldframe at hand, they may be plunged into the ground outside until they have had eight to ten degrees of frost. They should be screened in some way, so that the sun will not shine directly on the foliage when in a frozen state. After they have had their allowance of frost, they may be stored in a coldhouse—a late grapery, for instance; but the pots should still be plunged either into ashes or moist sand, for the benefit accruing to the plant when the roots are kept in a moist, even condition is really surprising. Strawberries prepared for forcing in this way should be in excellent condition and respond readily to further treatment. But all the details I have enumerated are necessary for a good crop of high grade fruit.

INSECTS—FUNGUS

Insects are not, as a rule, very troublesome. Red spider is one of the worst enemies, if allowed to spread; but it can be kept down easily with systematic spraying of the foliage every bright day until the plants begin to bloom, and again after the fruit is set. Care should also be exercised in airing and watering, for if Strawberries are in any way checked, they fall an easy prey to red spider. Green fly causes trouble at times, especially during a long, cloudy spell. Fumigation is here the only remedy and as a safeguard it may be well to resort to it just before the plants come into bloom. An attack by green fly at the flowering stage is a serious misfortune, for that is a period when fumigation is not advisable.

Fungus is more troublesome in some sections of the country than in others. The fungus most to be dreaded is that commonly known as leaf spot. It attacks the foliage, and will work havoc if not checked, weakening the constitution of

the plant. Bordeaux mixture or copper solution sprayed on the foliage will check it. The grower must be on his guard in the Fall, when the stock is prepared for forcing; but when the plants are taken inside the foliage is generally fairly free from any disease or fungous growth.

VARIETIES FOR FORCING

There are a number of varieties that will submit to the forcing process; but as it is not necessary to have many kinds, those should be selected that are known to give the best results. The blossoms of all Strawberries are either hermaphrodite (perfect) or pistillate (imperfect). The pistillate varieties are absolutely worthless for forcing purposes. Even with some that are classed as perfect-flowered varieties the pollen is very meager and cannot be relied upon for very early forcing. It is therefore best to select those kinds that produce a good supply of pollen.

Marshall has stood the test for many years as an ideal forcing berry as regards size, excellent color, and, above all, rich flavor. In some districts, however, it is not very robust, and in some localities almost a failure. But where Marshall can be grown healthy and vigorous, it is one of the very best forcing berries today, especially for early work.

A few years ago I secured 100 healthy plants of an English variety (Royal Sovereign), which would have been a valuable addition to our list, but unfortunately it seems impossible to grow the stock satisfactorily in our climate. At least, I tried and failed. Evidently others have not succeeded any better, for I have not been able to secure any stock of it since then. It is a very early, free setting variety, with large, conical fruit and excellent color and flavor. If healthy and vigorous stock of Royal Sovereign could be grown, I believe it would be one of the very best for forcing under glass.

Sharpless, while not grown as extensively in the field and garden as in former years, is still a good old standby that seems peculiarly adapted to indoor work; it will seldom refuse to bring forth an abundant crop of large fruit. The photograph (see page 181) shows its make-up. The berries will ripen evenly when under glass, which is not always the case when grown outside.

William Belt has made many friends since its introduction some years ago. It is a vigorous, healthy grower, and free cropper; the fruit is large, with solid flesh and good color. I do not recommend it for very early forcing, but if brought into heat about the first of February, the returns will be satisfactory.

Nick Ohmer is excellent for late forcing, especially if an extra large berry is wanted. With me, it has never failed to produce berries of the largest size and good shape.

Curiously enough, something promising will sometimes be brought to our notice. This happened to me in the early part of August, 1909. A Mr. Rose of Red Bank offered to sell me a Strawberry for forcing, recommending its qualities and behavior in the open. I purchased 100 plants. It proved an excellent grower, building up strong crowns before the Winter set in. The plants were brought into heat February 1st. They were a bit slow in throwing

up their blossoms, but after that their progress was rapid, and I gathered some of the finest berries that I have ever seen, solid, perfect in shape, color and flavor. I cannot find a single fault. The general habit is good and the fruit is carried on stout, erect stems. While two or three fruits will ripen up in the pot in advance of the others, the rest come along in time for gathering, and ripen to perfection. Nor have I lost a single fruit through damping. Surplus moisture has no chance to hang on it, as would be the case in a rough berry. It goes under the name of Pride of Red Bank.

Varieties for forcing purposes can be highly recommended as follows:

Marshall Wm. Belt Nick Ohmer Sharpless Pride of Red Bank

There are probably many other varieties that could adapt themselves to forcing, but, as I have said, it is not necessary to have a long list for the purpose.

CHAPTER XXX

THE HOTHOUSE PINEAPPLE

PROPAGATION—CULTURE AND FEEDING—WATERING—SHADING—AIRING—POT SYSTEM—INSECTS—VARIETIES

OF all hothouse fruit the Pineapple is perhaps the most expensive luxury. It requires at all times a fairly brisk heat, and is a bit slow in giving returns. About twelve months from the time the suckers are planted elapse before the fruit is ripe, and even then conditions must be very favorable. It may seem strange to recommend the cultivation of Pineapple under glass, when it flourishes in our Southern States without the assistance of artificial heat. Fine looking specimens come to our Northern markets, a visible indication of the wonderful tropical climate of the South. The question may be asked: Why go to the expense of growing Pineapples under glass, when one section of our country has an ideal climate for that fruit? If the fruit, as it comes up North, were allowed to stay upon the plant until perfectly ripe, it would be much finer; but for shipping to distant markets, it must be gathered in a stage of ripening to suit the destination. No one who has never had a taste of a hothouse Pineapple can realize the difference between the Southern product and our home-grown hothouse fruit. There really is no comparison between them. The Pineapple is improved wonderfully by growing under glass. In any establishment where fruit is made a specialty, the assortment would not be complete without a Pineapple house. Aside from the pleasure of gathering the luscious fruit—no such specimens could be purchased in the open market—it is highly interesting to watch the fruit grow and develop.

In former years the pot system was generally in vogue, although this involves much more work than planting in beds. It is, moreover, not agreeable to handle the plants and repot them when they get large. I find that they make a more satisfactory growth when planted out, which does away with extra expense of repotting, etc.

A suitable house is necessary for the successful cultivation of Pineapple under glass. The plants will thrive much better if placed somewhat near the glass; their growth will then be more stocky, and the fruit will develop better. Therefore, a very high structure is out of place; nor is it necessary to have a wide house. The proportions should be such that during the Winter months a night temperature of not less than 65° can be maintained in zero weather.

Bottom heat is absolutely necessary. The best house is a span roof running either east and west or north and south, preferably the latter. The temperature in the Winter should range from 65° minimum to 75° to 80° maximum. While the Pineapple thrives in this heat, it should not be dry or fiery. The plant wants a moist, humid atmosphere, and will then make a clean, healthy growth, but if the pipes are kept extremely hot, drying out the air, then we may look for scale, mealy bug, and red spider, a combination not at all agreeable. This difficulty can be overcome by placing a large system of pipes in a house of this kind.

A house fifteen feet wide is sufficient, with a good supply both of bottom and top heat. The hot water system is the best, running the pipes under the beds in hollow channels. Have the tile or slate over these pipes about one inch apart, so that the heat may work through; then put six inches of drainage before the soil is added, with about one foot of soil above this. These directions apply to the planting out in the bed, which is the most successful mode of culture, and by which the plants make a stronger and much quicker growth. It will take considerable space to accommodate a number of plants, for they are strong growers and need plenty of room. If much space is to be devoted to this culture, it is better to have two or three compartments, bringing the fruit along in rotation. Then as each crop begins to ripen it can be treated according to its special requirements. These include a drier atmosphere and considerable more dryness at the roots. I will explain both the bed and the pot systems.

The first consideration is proper soil. Heavy soil is not good. While the plants will make headway for a time, the effects of improper soil will begin to show toward the Winter, for the roots are liable to decay. The soil should be of an open nature, that can be thoroughly firmed around the plants and yet remain porous. I have found it at times almost impossible to procure just the right kind. If not naturally porous it must be made so. I have seen good results obtained with a mixture of loam and coal ashes, using enough of the latter to keep the soil open. Charcoal, coarse sand and leaf mold are also good and will insure perfect drainage. Very fine fruit has been grown in a sandy loam—but improved with fibrous sod land used in a rough state. The Pineapple will stand a rich compost, and this must be applied if extra large fruit is desired. Ammoniacal manures have been successfully used, especially for a luxurious growth. Peruvian guano, used occasionally in an evaporating pan, will create a certain amount of ammonia in the atmosphere, which is taken up by the foliage, imparting new vigor to it.

PROPAGATION

The Pineapple may be easily propagated, and there are different methods of doing this. The most general and satisfactory way of increasing stock is by the use of suckers, that is, young shoots which come away from the base of the parent plant. Some varieties reproduce more stock than others. The Queen Pine usually puts forth a great number of suckers, which may be removed at any time for propagating purposes, although if left until quite strong, quicker progress will be made by the young stock to follow. Suckers for future planting

should be removed by gently twisting them off with the hand; then remove a few of the small leaves, and make a clean cut at the base of the shoot, which is now ready for potting up. The size of the pot depends on the strength of the sucker. Generally a three-inch to four-and-one-half-inch pot will be sufficient. It will root readily in a mixture of loam and sand, within two or three weeks, if kept in a pinestove temperature, especially if there is also bottom

PINEAPPLE QUEEN

The above illustration shows a portion of a house of Pineapples planted in a bed of soil. Thus treated, they undoubtedly make more rapid progress than when grown in pots

heat. It is therefore well to secure the young stock early in the Spring, while the fires are still running, or to wait until the fires are again started in the Fall. While the suckers will also root at any time in the Summer without bottom heat, the stock set out with bottom heat will root more quickly and will come on more satisfactorily.

One thing is to be noted here: never allow the plants to get potbound or stunted in any way before planting. A stunted Pineapple is practically useless, for it would make an attempt to fruit before being strong enough to support its load.

Stock from scarce varieties, or from those that are stubborn in sending out suckers, must sometimes be obtained by other means. The smooth-leaved Cayenne is not nearly so prolific in offshoots as the Queen. Where suckers are not plentiful, good plants may be propagated from the crowns taken from the fruit, although these are not equal to suckers, nor will they make as rapid a growth; or by gills, which are offshoots produced at the base of the fruit, but these make even slower progress than crowns. The two latter methods are therefore only resorted to when stock cannot be produced otherwise.

There are still other ways of propagating very scarce kinds. The old plant may be pulled up after the fruit is cut, stripped of its foliage, placed in a shallow box covered with some light material, as leaf soil and sand about an inch thick, and treated to a brisk bottom heat; the dormant eyes will then start up. I have seen good stock produced by this method. In general, there should be little difficulty in getting a good supply of young stock at all times, as the plant roots readily under favorable conditions, with plenty of heat and moisture. The soil in the pot should be kept on the dry side.

CULTURE AND FEEDING

The Pineapple grower must absolutely know the requirements of his plants and the general treatment they demand throughout the year, if he is to be successful. I have said that top and bottom heat is essential, especially during the Winter. This plant cannot endure "cold feet." The soil around the roots should be as warm as the atmosphere of the house. The most rapid growth is made from Spring until Fall and more moisture is needed at this time. The temperature and watering are important. From Spring to Fall there should be 70° at night and 80° to 85° by day, with a moist, humid atmosphere. During the Winter 5° less may be maintained.

In the planting out system, which I recommend, a compost should be selected that will keep porous, and will not turn sour. Pines will not thrive in a stagnant bed, for the roots will decay. When the root action is good, they will take a fair amount of feeding. In preparing the compost, all the ingredients that are mixed in with the soil should be of a lasting nature. Blood and bone are excellent for promoting a steady growth. Take about half a bushel to an ordinary cartload of soil, a fairly coarse grade of bone, with a light sprinkling of wood ashes. Potash is necessary in the soil for Pines. The compost should not, however, be made over-rich, for a surface dressing may be easily applied after the plants get established thoroughly.

In setting out the stock into the permanent beds, only strong, thrifty young suckers should be selected, preferably such as are well established in five-inch or six-inch pots. They should be set twenty-two inches apart, as they want plenty of room to spread out. Firm the soil thoroughly around the young plant; this will make the growth more substantial and stocky, with roots that will perform their work and are not so liable to decay as when growing in a loose soil.

If a bed of this kind is carefully prepared with good drainage, a couple of crops may be gathered before renewing the soil and stock. When the first crop is off, a strong sucker will usually come away at the base of the old plant; the latter can then be cut down and the sucker may take its place. If a portion of the surface soil is now removed and a good top dressing applied, this sucker will make rapid headway, and another crop may be had within nine or ten months if all goes well. But it depends upon circumstances. If root action is poor, it would be folly to make the attempt. If the bed is in good condition, two good crops may be gathered, with a saving in time and labor. The plants should be sprayed lightly in the morning and again in the afternoon, except in damp or very cloudy weather. Do not spray while they are in flower.

Feeding requires good judgment. The plants must be in a good, strong condition before the fruiting stage is reached, otherwise they cannot bear large fruit; light feeding may, therefore, be of benefit before they set their fruit, although the bulk of feeding will generally be done while the fruit is developing. Excellent results are obtained by the use of blood and bone, also potash and ammoniated foods. All these should be applied with a view to building up the plant and bringing the fruit to the highest state of perfection. Even a little nitrate of soda may be used to good advantage when the fruit is swelling, in the proportion of a small tablespoonful to three gallons of water, and applied a couple of times while the fruit is developing; this will increase the weight and make for perfect finish. Drainings from the horse stable are also good, if so diluted as to avoid danger of burning the roots. Quite a little ammonia may be obtained in this manner. In any case, this treatment seems peculiarly adapted to the Pine, which will respond freely to it, if everything else is working satisfactorily. But it will avail nothing unless root action is perfect at all times; with sluggish root action no amount of food will do any good. If the Pineapple plant under glass is checked even once, and loses its roots, it may as well be cast aside and a fresh start made. While fruit may be had from a plant that has received a setback, such fruit will be undersized, poor in quality, and not worthy the name of hothouse fruit. But if the compost is carefully selected and of a kind that will not readily sour, there should be no difficulty in producing a fine crop under glass. There is no outdoor fruit to compare with the hothouse Pineapple as a dessert delicacy; but if it is treated carelessly in the matter of watering and airing, it will certainly react and be a cause of disappointment.

Top dressing is of importance in producing active roots. The same material as that recommended for the bed should be given, although a larger quantity of blood and bone may be added. When first planting a house it is well to allow space for top dressing about twice during the season. The plants will show their appreciation of such treatment within about a week by sending their roots through the soil with new energy and more intense color to the foliage. While plants cannot talk, as is often said, their actions occasionally speak plainer than words. If we watch plant life closely, we may learn many valuable lessons from their mute behavior.

WATERING

Pines thrive much better and make a more substantial growth if they are kept on the dry side; they will not endure an over-supply of moisture at the roots. Yet if they are healthy, especially during the Summer months, when they should be making rapid headway, they will take considerably more moisture than when in poor condition for want of the necessary bottom heat or atmosphere, or both; in this case they cannot evaporate any large quantity of moisture, and too much of it then will favor decay. But enough water should be given to moisten the bed from top to bottom; this soaking through is important, for the bottom heat will absorb moisture, and merely a light watering will give a moist surface, with a dry bottom, a combination that is by no means satisfactory to the plant, and would bar eventual success. Therefore, water thoroughly once, and no more until absolutely necessary. As during the Winter the plants make slower progress they want less moisture at the roots, but they will withstand a good supply of it in the atmosphere, in the way of dampening down the walls, walks and all corners. Dry corners are a breeding place for undesirable insects. While growth is less active in the short days, we must remember that the Pineapple has no resting period, from the time the sucker is planted until the fruit is matured; therefore, it should not be allowed to get dried out to the extent of checking the growth. Moreover, during the Winter months the water must be of about the same temperature as the house; there is nothing worse than to apply cold water either to the roots or the foliage in the Winter months, as this causes a chill.

SHADING

The pineapplehouse will withstand all the light and sun it can get during four or five months of the Winter, but from Spring until Fall it must have a light shade. This may be secured either with roller shades or by painting the glass with naphtha and white lead, just enough to break the strong rays of the sun; otherwise the foliage will burn and cause disfigurement, with serious damage to the plant. Watch the foliage very closely in Spring, and as soon as it turns a bit brown the shade should be given. Again in the Fall the foliage needs attention. If naphtha and white lead is used, it should be removed by degrees, to accustom the foliage gradually to the sunlight. This will avoid the risk of scalding or disfigurement, that would remain as an eyesore all through the Winter, aside from weakening the plant.

FEEDING

Feeding will depend on circumstances. If the roots are lively, more food can be given, which will increase the size of the fruit. Every grower, of course, wants fruit of the largest size, and this can be obtained only by perfect root action and systematic feeding. Although I do not think it is wise to use much liquid manure from the farmyard, yet it may be applied a couple of times to

PINEAPPLE SMOOTH-LEAF CAYENNE

A fully matured Pineapple, grown under glass. This fruit is wonderfully improved by hothouse treatment

good purpose; chemicals, also, are effective and keep the beds in an open, porous condition. Ammoniated manures and potash promote the healthy growth of Pines. Ichthemic guano, in the proportion of one part of guano to ten of soil, may be applied as a light dressing whenever the plants are in need of water, for it is best to water this in as soon as put on. Clay's manure, however, is best adapted for using in the water, a small handful to a three-gallon can of water.

AIRING

Proper airing requires good judgment. Carelessness here will destroy otherwise good work, particularly in the Spring, when we have sharp, cutting winds. At this time no more air should be admitted than is really necessary. There are two points to be borne in mind here: in the first place, if so much air is admitted as to lower the temperature suddenly, it would cause a severe check; and in the second place, it would cause too dry an atmosphere, which would not be agreeable to these hothouse plants. The best plan to follow is to admit a crack of air when the temperature registers 78° or 80°; then allow it gradually to climb up to 85° with sun, adding a trifle more air if necessary. Keep the house in a fairly steady condition, with plenty of moisture all through the growing season, or until the fruit begins to ripen, when a drier atmosphere should be maintained, with less water at the roots. This will cause a much richer flavor. The perfume of the Pineapple as it begins to ripen is very pleasant. As the fruit gets colored it may be cut, and it is improved by being hung up in the house for a day or two before using; it will then be thoroughly softened and may be eaten with a spoon. It will be found full of rich juice, with an exquisite flavor, which must be tasted to be appreciated.

Stock for replanting should not be lost sight of. Much time may be saved by having good, thrifty young suckers in six-inch pots ready to replant whenever the old plants are discarded. Then it will take only a day or two to put in new soil, allowing a day more for it to warm up before setting in the new plants.

A grower following the methods herein described may be reasonably sure of success, for we have an ideal climate for the culture of Pines, and all they need at our hands is care and good treatment.

POT SYSTEM

More Pines have probably been cultivated under the pot system in former years than in any other way. I gained my first experience with them in this way and with the same climatic conditions under which I was working then, I should prefer it. Climate of any kind certainly has a wonderful influence upon plant life, even though it be under a glass roof. I do not gainsay the advisability of confining the Pineapple plants to pots in a moist, moderate climate like that of England, where at times very little fire heat is needed, especially in the south, and where there is much more moisture in the atmosphere, as compared with the American climate. What applies to one climate may therefore not be suitable to another, and while I shall indicate the methods of pot

culture, I do not hesitate to say that I prefer the planting out here in our drier atmosphere. It involves less trouble, and the plants will make a quicker and stronger growth.

The instructions as to soil, perfect drainage, etc., given for bed planting apply also to pot culture. The size of the pots should be taken into consideration. A twelve-inch pot is ample for the final shift, or what is generally called the fruiting pot. Nor is it well to give too small shifts, as the potting soil is best used in a fairly rough state. Repot from six-inch to nine-inch and from nine-inch to eleven-inch or twelve-inch, thus allowing space to use the compost in a rough, lumpy state. Firm potting is essential, and the watering should be done carefully until the roots penetrate through the new compost. Do not pot Pines in cold soil—warm it up first. I need not go into details here as to feeding and general culture, for what is good for the Pine in the bed is also good for the Pine in the pot. The latter may require somewhat more feeding, but otherwise the culture is the same. Bottom heat is equally essential for best results. While we might grow a few Pines in one end of a plantstove, without bottom heat, there would be no comparison between the two. The same shaped beds as recommended for planting out will be about right for the pot system. Plunge the pots into some light material; tanbark is excellent and will keep wholesome for a year, and the slight odor given off by the bark seems agreeable to the pines. The most important point to bear in mind, here as elsewhere, is perfect drainage. The pots should be carefully crocked, so as to ensure a perfect outlet for all surplus water, particularly when transferring to the fruiting pot, for the plants will remain in these, their largest pots, for a long time. If a Pineapple plant is not looking happy, the cause will generally be found in clogged or imperfect drainage, showing plainly the importance of this simple matter.

INSECTS

Insects are not, as a rule, very troublesome in the pinestove, if the proper amount of moisture has been maintained. The best antidote is a steady temperature with enough moisture to keep up a healthy growth. Very curiously, scale attacks a sickly plant in preference to a healthy one. But in any case, a sharp watch should be kept for any insects that may appear and means should be adopted at once to check their spread, but there is not much danger of this if the spray or syringe is used effectively. It is fortunate that this is so, for the pineapplehouse when the plants are full-grown is more like a little forest than a collection of plants. The cheapest way and the one best for the health of the plants, is to adopt precautionary measures, even though the plants be clean. I have found a weak solution of whale oil soap for syringing the foliage, say once in three or four weeks, admirably effective in keeping the foliage clean and healthy: a piece of soap about the size of an egg to four gallons of water.

Mealy bug should be watched closely, for it will increase very rapidly in the pinestove temperature. It works its way around the axils of the leaves and then into the fruit. There is also a fine scale which is even more destructive

than mealy bug if allowed to go on unchecked. This white scale usually appears on sickly plants, or is caused by too dry an atmosphere, or the two together favor its rapid spread. But with initiatory methods that are disagreeable to insect life there should be little trouble in keeping the plants free from these pests. Red spider will also play havoc with careless management. The best way to fight these pests is never to allow them to establish themselves.

A good preventive against mealy bug, red spider, etc., is a spray once in a while with any of the insecticides recommended for that purpose. The pine-stove, to be successful, must be kept free from all noxious insects, and this will be an easy matter if taken in hand in time.

VARIETIES

Although there are quite a number of varieties under cultivation, it is not necessary for the individual grower to have a large assortment. About half a dozen of the kinds best adapted for hothouse work is sufficient. The stock should also be selected with a view to pot or bed culture, for some varieties are stubborn to handle, especially when the foliage gets large. Where the Pines are planted in beds, the spiny margin of the leaf does not matter so much as in potting, but it is not very pleasant to repot a plant with rough, jaggy foliage. However, some of the varieties with the spiny margin leaf are excellent for fruiting under glass.

One of the best for pot work and easiest to handle is Smooth-Leaf Cayenne, which is very fine either for growing in pots or planting out. Unfortunately, it is very shy in producing stock, often refusing to throw out suckers. But Queen Pineapple will always produce an abundance of excellent stock. Both of these kinds have been grown for many years, and are still as good as any for fruithouse work.

Charlotte Rothschild has been classed as an extremely large Queen; I have known it to produce fruit weighing from seven to ten pounds each. Although it bears the Rothschild name, its history is somewhat doubtful; it is supposed to have originated in Baron Rothschild's garden near Paris.

Lady Beatrix Lambton is a variety raised at Lambton Castle, Scotland, about 1860; it also has produced some very large fruit. Mr. Hunter, while gardener at Lambton Castle, is said to have picked a fruit of this variety weighing over eleven pounds!

The following list gives a sufficient assortment and may be relied upon for forcing purposes: Queen, Smooth-Leaf Cayenne, Lady Beatrix Lambton, Charlotte Rothschild, Enville, Lord Carrington, and Black Jamaica. The two best among these are Queen and Smooth-Leaf Cayenne.

VEGETABLES UNDER GLASS

CHAPTER XXXI

VEGETABLES UNDER GLASS—FORCING OF LETTUCE

Treatment of Lettuce and How to Keep a Constant Supply—Soil for Vegetable House—Distance—Temperature—Airing—Feeding—Watering—Diseases—Varieties of Lettuce for Growing Under Glass

PROBABLY all establishments make provision for vegetables. Where fruit is grown out of season, there will also be accommodations for the Winter crop of vegetables, which are just as essential as the fruit. The two crops will work in harmony, and no establishment is complete unless it can produce a liberal supply of vegetables at all seasons of the year. There is always a brisk demand for these products of the soil and commercial growers have long since undertaken to satisfy it all the year round. During the past few years mammoth houses have been built for this purpose. Fifteen or twenty years ago such structures would have been considered mere folly. I am not in a position to state the exact increase in this line of hothouse work, but I know that its growth has been phenomenal, a convincing proof that the consumers' demands yearly grow larger and larger. While the Northern grower has to compete with the Southern outdoor product, the latter cannot compare in quality with that emanating from houses especially built for the purpose.

I do not class vegetables as a luxury, but rather as a necessity of life, and it is not an expensive undertaking to grow them. The requirements in fuel are trifling when compared with those of many of our exotic houses, the temperatures needed being entirely different. Much credit is due to the commercial grower for advancing and popularizing the indoor product, which is sent to the open market where the consumer may see and appreciate its standard of excellence. Private establishments have probably been growing vegetables and salads ever since greenhouses came into use, but these are not, as a rule, sent to market. This private industry, therefore, has had little effect in educating consumers in general to appreciate the hothouse product. Artificial market gardening brings in fair returns, aside from providing steady labor for a large number of hands. Many years ago it was thought necessary to have the salad growing up near the glass, but we now know from experience that some of the best results are obtained in the enormous houses built especially for the purpose of vegetable culture.

In making preparations for growing vegetables under glass, each grower will be governed by the circumstances peculiar to his case. If a commercial enterprise is intended, the greater returns will come with the larger house; but for private purposes the man in charge will probably know best the needs of the table he is to supply. Some families will require more salads than others, and when the necessary vegetables are scarce they seemingly consume to the limit.

Whatever style of house is contemplated, let it be a light one, with plenty of sun from morning till night. A location of this kind is necessary in order to produce good vegetables and salads. Some of the old-style houses, with enough lumber in them to build an ordinary dwelling, have more than half of their sun shut off in the short days, by woodwork and rafters. Most of these have, fortunately, now passed along the way of things that have outlived their usefulness, and more suitable structures are reared at the present day.

Great credit is due, as I have already said, to the different growers for improving the varieties. Take Lettuce, for instance: I do not think that I am overstepping the mark when I say that it is now forced by the millions as compared with thousands a few years ago. This huge expansion may be explained by the fact that the improvement in greenhouse construction, with the increased and better facilities, has stimulated the growers to improve their products correspondingly.

Vegetables have been grown in every conceivable kind of structure—leanto, three-quarter span, span roof, and years ago the sunken greenhouse or pit was much in vogue. The most satisfactory house, however, for the forcing season through, is a span roof about twenty feet wide and fifty or more feet long, according to the requirements. A vegetable house may run east and west or north and south; the latter is preferable, as it gives more even sunlight on each side. But where the location demands it, the house may run east and west without detriment to the stock, if judgment is used in planting. Tall vegetables, such as Tomatoes, etc., may be planted in rows crosswise of the house, thus allowing the sun to shine between, which will help to firm up the growth.

There is quite a variety of vegetables that will respond to indoor culture. The staples, which I may call the bread-and-butter kinds, are Lettuce, Cucumbers, Tomatoes, Radishes and Mushrooms. Years ago a large part of the vegetables produced under glass was grown on raised benches, and even now this is an excellent way during the short days of Winter for Tomatoes, Cucumbers, Beans and the like, or what I may call warm-blooded vegetables. While we may see all kinds of vegetables growing and flourishing together in the open garden, it is better in the hothouse to keep the cold-blooded kinds apart. Lettuce, Cauliflower and Radishes thrive splendidly together, and solid beds are without question the best for them. They will feel more at home in such a location, and both Lettuce and Cauliflower will be much larger and in every way of better quality, and, above all, a quick growth will be obtained.

I shall take up each variety separately, giving prominence to those kinds that are in most general demand.

More space is probably devoted to Lettuce today than to any other vegetable or salad. There is always a heavy demand for it in every month of the year, and the hothouse produce is generally away ahead of salad grown in the garden or open field, especially when grown in solid beds. The private gardener knows well enough how important it is to have always a full supply on hand. The general public also has been educated to appreciate the value of this health-giving green all the year round. Another thing in favor of the grower is, that the returns are quick, as three or four crops may be gathered from a house during the forcing season.

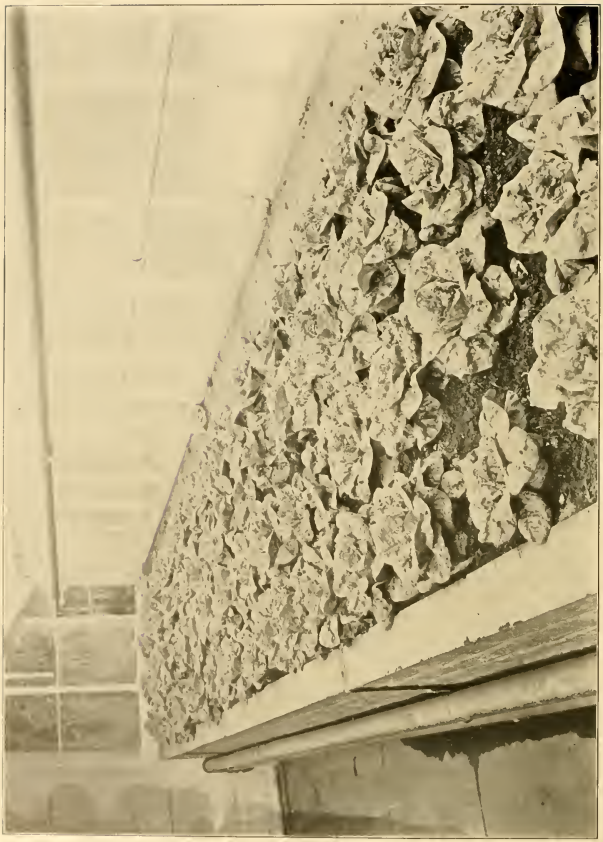
TREATMENT OF LETTUCE AND HOW TO KEEP A CONSTANT SUPPLY

Proper soil plays an important part in the successful culture of Lettuce. When growing this crop in the open, we find that it thrives splendidly in a rich sandy soil with good drainage. While it will withstand much moisture at the roots, good drainage is necessary. If grown in solid beds, it does not often require water. Sometimes the surface will appear dry, but on close examination plenty of moisture will be found below. This will encourage root action to penetrate down, whereas watering often will keep the surface wet and encourage surface roots. With Lettuce we prefer to have the roots work down, for then we shall have a strong, vigorous growth, that will stand by the plant until maturity. Rich, open, porous soil that will make Lettuce grow well in the garden will do the same in the house. Quick growth is essential in Lettuce, and this cannot be had on impoverished soil.

SOIL FOR VEGETABLE HOUSE

For a vegetable house with solid beds ten inches or a foot of rich soil is none too much, provided there is perfect drainage below. A good coat of farmyard manure, thoroughly decayed if possible, seems to suit the requirements of vegetables. I do not approve of green manure for an indoor crop. A light coat of wood ashes, according to the nature of the soil, may be sowed on the surface just before planting time. Wood ashes is, in fact, good for all greenhouse vegetables.

The greenhouse Lettuce crop should come in about the time when the outdoor supply is cut down by frost, which will occur any time from the middle of October to the first of November, within a radius of about 200 miles of New York City. Preparations should therefore be made to have the supply about ready at that time. In many private establishments vegetables in frames take the place of the outdoor product for at least a month or six weeks. Excellent Lettuce can be produced in this way, until severe freezing sets in, when it is less troublesome to rely on the greenhouse product. Lettuce for framework should be sowed about the end of August; then, if everything goes well, the first crop should be ready for use about the first of November. The seed may be sown in flats, and for early planting frames are convenient to bring them along. Later on the lettucehouse can furnish the supply for the Winter.



Lettuce May King

Representing a batch of May King, about half matured. This variety is excellent for early Winter and again toward Spring

Before sowing Lettuce, give the soil a good watering. The seed should be covered, according to the old reliable method—putting on soil twice the thickness of the seed. The smaller the seed, the less soil will be necessary. I believe that much good seed has been ruined by placing it too deep in the soil.

Transplant the seedlings when they are large enough to handle and before they become in any way drawn. Place them three or four inches apart, and in sufficient quantity to satisfy the demand. They may be transplanted into flats, or a bed prepared for the purpose if a large quantity is required, in about three or four weeks, according to the season. In early Fall they will make quicker headway than in Midwinter. This work should be done in any case when they have grown into nice, thrifty young plants, and before they crowd into each other. This transplanting will induce a plentiful supply of roots. When they are transplanted into their permanent bed for maturity, they may be lifted with considerable soil adhering to the roots, and as a result they will grow away without a check. It is not necessary to have the seedling bed of quite as rich a compost as the permanent bed. If the soil is made over-rich for seed beds, the roots at that stage are not in condition to withstand such treatment.

From the time the first batch of Lettuce matures, whether produced in the frame or the vegetable house, there should be a continuous supply from the first of November until March, or later if necessary. This may be easily accomplished, with sufficient space at command, by sowing seed about every ten days. These subsequent plantings are treated exactly like the first. I would recommend the following as a good method for attaining this greatly desired result—a steady supply. Every grower has probably some plan as to the space he will devote to his Lettuce, or to any other kind of vegetable. I think it well to have some definite idea—what I might call a kind of schedule—as to the apportioning of space.

Granted that we have decided on our Lettuce plot, we will divide it into four parts, or in other words, make four plantings, each about ten days apart. When the space is filled, the lot first planted will be about gathered, and there will be plants to follow along in rotation, which will give a steady supply all through the Winter. The amount that can be produced under glass is remarkable, when crops are made to follow each other through the forcing season. Whether the vegetable house is twenty-five feet long or two hundred feet, with system we can have our four crops or sixteen plantings altogether, or more if we have nice plants ready to replace the crop just gathered.

It will not be necessary to add manure for each crop, if a good coat was added in the Fall just before setting the first crop. In preparing the beds for permanent planting a couple of inches of manure may be dug in thoroughly. Decayed manure from the horse stable is good for this purpose, digging the beds at least a foot deep. This coat should be sufficient to carry the crops through the season, but a light sprinkling of wood ashes for each crop planted would not be amiss, if scattered on before preparing the bed for replanting. The ashes will then be well incorporated with the soil.

DISTANCE

Most Lettuce grown under glass is probably head Lettuce of the Boston Market type. Some varieties of this are somewhat stronger growing than others. May King, for instance, which does exceedingly well under glass, requires to be planted nine inches apart each way, but for most other head Lettuce eight inches each way is about right. Have the beds moist when planting or just in a friable condition. Where the loose-headed type is grown, such as Grand Rapids, a space of ten inches each way may be allowed. Grand Rapids will also thrive better in a somewhat heavier soil; at least, heavier heads can be grown in such soil. There is apparently more demand for head Lettuce in the vicinity of New York than for anything else.

TEMPERATURES

There may be a difference of opinion among growers as to temperatures for Lettuce. Undoubtedly, if it is kept around 50° at night and correspondingly high in the day, it will mature somewhat quicker. But Lettuce forced to the extreme will be of poor grade, and the gain in time is offset by loss in quality, color and weight. As it is the high grade article that is most in demand, I cannot see the advantage of severe forcing, and I do not recommend it, for several reasons. In the first place, the plants are more liable to go wrong, and in the second place, few people want those soft, loose heads. Where Nature is allowed to do her work, we find Lettuce in its full glory, that is, when the nights are cool and the days around 60°. Then why advocate a warm night temperature? When Lettuce is brought along in a comparatively low night temperature, particularly when it begins to head up, its progress will be rapid. This is a clear enough indication that cool nights are agreeable both to the health and the vigor of the plant. Each grower must, however, use his own best judgment. When the weather is bright and clear, rather than have a setback, it will do no harm to allow about 65°, with a fair amount of air on; but on a dark, cloudy day this would be a serious error. I consider a reliable Lettuce temperature about 40° to 45° by night, with a rise of 10° to 15° during the day, according to the weather.

AIRING

Airing is an important factor in a successful Lettuce crop, for it is naturally a fresh air plant, and cannot withstand a close, humid atmosphere. It is well to leave a crack of air on both day and night, at least until the frost sets in. Such treatment will make the plants more thrifty and less subject to disease. Careless airing is one of the first causes of failure, for while Lettuce is not especially sensitive to cold blasts when growing in the open, it will not withstand careless treatment under glass. The great secret of success is to grow it along without a check, from the time the seed is sown until it is ready for cutting. The result of careless airing is, a check and other troubles, as disease, green fly,

etc., will follow. Airing should always be done by degrees, not admitting too much at once. Growers should bear in mind that the temperature for any plant should be changed gradually, both in the morning when increasing and at night when reducing it. Air should never be admitted to the extent of lowering the temperature suddenly. It is poor policy to allow the temperature to rise more than five degrees over night before increasing the air. There should be a steady rise with a steady increase of air. This suggestion, of course, refers to the Winter temperature. In the early Fall and again in the Spring quite a bit of air should be left on all the time. Good growers know the importance of carefully regulating the ventilators. The inexperienced should study this matter until they have mastered it, for the welfare of the plant depends largely on it. At times airing seems like a nuisance, but it is one of those troublesome things that we cannot afford to neglect.

FEEDING

It is not necessary to feed a Lettuce crop much if the soil in the bed is well supplied with manure; but if the soil needs any assistance, this may be given between crops, for it is not easy to feed a growing crop. Nitrate of soda, however, is good to give as the Lettuce is beginning to head, for it will increase the size and hasten maturity. The most effective way of using the soda is in water in the proportion of a tablespoonful to three gallons. Give the plants a moderate watering with this, keeping it off the foliage as much as possible. Do not use the nitrate of soda when the soil is dry. It is better to give the bed a moderate watering first, allowing this to settle, and then give the soda on the following day. This applies where Lettuce is grown on a moderate scale, but where it is grown in wholesale quantities, the soda may be sprinkled in between the rows and then watered in; considerable labor will be saved in this way. But in whichever way it is given, a moderate amount of soda is excellent.

WATERING

The advantage of solid beds becomes apparent in watering, for they do not require water very often, especially after the crop is well established. When water is needed give a thorough watering and then no more until necessary. A thorough soaking when the plants begin to head will help to increase the size and assist the heading. A good drenching at this stage is usually sufficient to finish up the crop. No set rules can be laid down in this matter, however, as much depends on the nature of the soil. Some soils take considerably more water than others. As a general rule, when the soil gets dry, water must be applied.

DISEASES

Lettuce is unfortunately subject more or less to disease. Much has been written on this question and considerable advice given. The Lettuce disease has been called sunburn, but this term is misleading, as the disease spreads

more rapidly in cloudy weather than when it is clear. I am inclined to attribute it to poor root action, or cold, imperfect drainage, or lack of free ventilation, each of which, singly or combined, will bring on this dreaded disease. I will not attempt to give any remedy or cure for it; the best suggestion I can make is, to give all the fresh air possible and have the foliage dry over night. When badly infected, it is not worth while to waste any time over the plants, but just pull them up and start afresh. Here, again, the grower must make preparations for a clean start, or the trouble will be likely to reappear with the new crop.

When this fungus once gets into the beds, measures must be taken to eradicate it. A grower with the necessary equipment, or having a steam plant instead of the hot water system, can sterilize the soil and thus kill all the fungous growth, Have a series of perforated pipes buried in the beds and attached to the steam system. Let the holes be about one foot apart, and of a size in accordance with the steam pressure. Cover the bed with some close material, as canvas, before beginning to steam it. Place enough pipes in the soil to heat it up to near 200°. Establishments not equipped with steam must adopt other methods. In a bad case of infection remove about an inch of the surface soil and replace it with fresh soil, adding a light coat of air-slaked lime. But with a compost that is free and open, which induces free root action, there should be little cause for disease.

Another thing to guard against is the destruction caused by aphis. Lettuce will absolutely refuse to grow when infested with green fly. Various methods may be adopted to fight this insect. The very best plan is, not to wait until the plants get infested, but to take precautionary measures at the right time. There are several good fumigating materials that are excellent for destroying insect life. Any one of these used in a mild form before the fly appears is decidedly better than waiting until it is there. There is nothing so effective in eradicating insect life as hydrocyanic gas. If this is used once or twice while the Lettuce is still young, or before it begins to head, there will be no trouble with fly afterward, for it certainly makes clean work with the fly, without harm to the growing crop. Hydrocyanic acid gas is one of the most simple remedies, and, above all, one of the most economical. It is death to the fly, even in a very mild form. In using it, however, we must remember that we are dealing with a deadly poison, and it should be treated as such at all times; but there is absolutely no danger when it is handled carefully. A close house is necessary; the gas will escape if there is any outlet, either above or below grade. If there is any hole where the pipes enter the house, as is often the case, this should be filled up with leaves or anything else that will hold back the gas. The cyanide of potassium can be purchased of different strengths, up to 98%. The kind I have always used is 50 fuse or 50% pure, using one-half ounce to every 1000 cubic feet of space. Earthenware receptacles must be used; two will be sufficient for a house fifty feet by twenty feet. Place them at an equal distance apart, and have the jars considerably larger than necessary to hold the material. Gallon jars are not any too large. The operation seems so simple and withal so effective, that it is strange that this gas is not more generally

used. People are perhaps shy about handling this poison until they have used it a few times, after which they will admit it to be one of the simplest of fumigating materials. It is merely a question of knowing the proper strength for destroying insect life. Anyone who has not had experience with this gas should experiment with a very weak application at first, gradually increasing the strength until satisfactory results are obtained. The foliage must be dry when the gas is used, and choose a calm night. The first operation will involve a little more trouble, on account of the preliminaries. First of all we must compute the cubic content of the house. Then, if two or more receptacles are required,

LETTUCE IDEAL

Ideal Lettuce will be found excellent for growing through the short days. Although not a large variety, it is quick to mature and produces solid heads

the cyanide must be divided into equal parts, and each package tied in tissue paper. There must be enough water and sulphuric acid in the jars to just cover the cyanide, or one pint of water and one-half pint of sulphuric acid for two or three ounces of cyanide. Get the best commercial acid. When everything is ready and the house closed up tight, pour first the water into the jar and then the sulphuric acid, then drop in the cyanide, starting at the far end and working toward the door. Merely drop in the poison and get out as quick as you can, not waiting to see whether it is beginning to boil up or not. Then

lock the door and keep the house closed up tight for about an hour, or with mild fumigation it may remain closed all night. It would be well to have the cyanide broken up in small pieces before using it.

VARIETIES OF LETTUCE FOR GROWING UNDER GLASS

There is quite an assortment of Lettuce that will submit to the forcing process, but those varieties should be selected that will head up quickly, such as the Boston Market type, or May King. While the latter requires more space than some of the other head Lettuce, yet perfect heads can be produced under glass.

The following varieties will all respond to indoor treatment: Boston Market, Rawson's Hothouse, Rawson's Crumpled Leaf, May King, Golden Queen, Ideal, Hittinger's Forcing, Glasshouse and Big Boston. Loose-headed variety: Grand Rapids, an excellent forcer and shipper.

This list is sufficient for all practical purposes, and includes probably more names than the average grower will need. Each may choose that which he prefers, for they are all adapted to the forcing process and good results may be obtained from all with proper treatment.

CHAPTER XXXII

CAULIFLOWER

Watering and Feeding—Varieties

CAULIFLOWER requires exactly the same treatment as Lettuce in regard to temperature and solid beds, but it will be decidedly improved by a heavier soil. If grown in a soil that is in any way light, the heads will be light, and the plants are also likely to be troubled with clubroot; when this once sets in it is difficult to overcome, and, in any case, it limits the produce to very small heads, or what are termed "buttons," not worthy the name of Cauliflower. The soil should be a fairly heavy loam, with good drainage, and well enriched with thoroughly decayed farmyard manure. During the season of growth the plants should be well fed with food rich in nitrogen. I do not know of any vegetable that is more improved by nitrate of soda than the Cauliflower. Give a couple of applications, the last just as the plants begin to head up. Nitrate of soda seems to impart color and vigor, with extra weight of head, provided there are other stimulants in the soil agreeable to a steady growth.

Cauliflower under glass proves a successful crop, if planted in a good, rich loam, as there is no disease to trouble it, with the exception of clubroot, brought about by too light a soil or a check. As a preventive against green fly the plants may be liberally sprayed at any time; plentiful moisture in the foliage is moreover beneficial. Under these conditions the grower need not worry over insect life.

This vegetable grown under glass is an immense improvement on the outdoor product, and it is all the more appreciated for coming along during the short days. It should appeal to all private establishments as a Winter forcing vegetable. While it may be held over quite a while in frames after the frost has cut down the outdoor supply, yet there should be provision for at least one or two crops in the vegetable house.

In making preparations for Winter Cauliflower, one important item should be borne in mind, namely, that from the time the seed is sown until the crop is ready for gathering, it must not receive a check, either by want of water or lack of anything else necessary for its growth. This holds good particularly in the early stages, so as to avoid premature heading, for such a crop is small and of poor quality and practically worthless. It is not advisable to make too early a start, or to plant in the house until the nights have become fairly cool,

Cauliflower Snowball

A glimpse of a crop very nearly ready for use, growing in solid beds, where they feel more at home than on raised benches

for Cauliflower cannot withstand any great heat. In any case the results will not be the same as those obtained with a normal temperature. Let the weather conditions govern the first sowing; this is usually safe from the first to the middle of September. The seed may be sown in a flat or in a coldframe. When the young plants are large enough to handle, transplant four or five inches apart into frames; if the crop is intended for private use, where only fifty to one hundred plants are needed, they may be transplanted into flats. As they get established, and have grown a good supply of roots, they may be transplanted into their permanent bed, sixteen or eighteen inches apart each way. Here again preparations should be made for a steady supply. Seed may be sown in succession about three weeks after the first sowing, or three or four plantings may be made about three weeks apart, if the space permits. If the seed is started in September, the plants should be ready for cutting some time in December, that is, if they receive good treatment and are kept in a fairly cool, Lettuce temperature.

Cauliflower may be planted in a bed from which a crop has just been cleared. Much time may be saved by having young plants ready in five-inch pots to set in the place of the last batch; but these plants must not be allowed to get potbound, for when once the growth is checked that crop may be regarded as a failure. After the plants are set out and established, cultivating the surface soil will promote a healthy, robust growth. Every gardener knows the value of surface cultivation in open air beds, especially after rain, when the soil will work freely. The same applies to inside culture. Stir the soil after the plants have received a good watering. This will act as a mulch, preventing too rapid evaporation and keeping the soil sweet and wholesome.

WATERING AND FEEDING

Cauliflower requires an abundance of water at all stages of its growth, taking much more than Lettuce. Spray the foliage two or three times a day unless it is very damp outside, for then spraying is of no benefit at all. As to feeding, I think it is much better to feed light and often, rather than give too much at one time, and more food can be applied to good advantage in this way. Overfeeding is worse for the health of any plant than no food at all. Cauliflower wants food rich in nitrogen, but it is not necessary nor even wise to depend on one manure alone. Potash may be used in the shape of hardwood ashes, which will give color and substance to the crop. Begin to feed when the plants are thoroughly established, or quite a while before they begin to head. Try to build up a good, strong, thrifty growth before the plants show any sign of heading, for such growth is necessary in order to obtain good-sized heads. Cow manure in a liquid form is excellent, and may be applied two or three times. Supplement this with nitrate of soda, used either in the water or sown over the surface and then watered in. Remember that soda is a powerful chemical and must be used with judgment; while a little of it is excellent, an overdose acts as a poison. A safe proportion is a tablespoonful to a three-gallon

can of water, and about the same strength if sown on the surface. Cauliflower readily responds to a couple of applications of soda.

I have occasionally heard objections to extra large heads of Cauliflower, as being coarse, and this is true if they are left on too long; but if we can produce size while the plant is still young and tender, then we have both quality and size combined. The heads should be cut when quite solid. If a leaf is turned over as the heads begin to develop, to prevent the sun from striking into it, we get, not a bluish, but a snow-white head.

The most destructive insect is perhaps the caterpillar. In early Fall we often see white butterflies busy among the plants, depositing their eggs on the under side of the leaves; in a short time these develop into a small green worm, which must be destroyed either with a dusting of slug shot, or removal by hand before much damage is done to the foliage. Later in the Winter the moths will not be active, and there will be no other insects to bother.

VARIETIES

The Early Erfurt strain and the Early Snowball are the best for growing under glass. The following four will give good satisfaction: Extra Early Dwarf Erfurt, Early Snowball, First and Best, and Gilt Edge. Some people object to Cauliflower when grown in the open, as it is at times a bit strong, but this disagreeable feature disappears when it is grown under glass. Greenhouse Cauliflower may rightly be classed as one of the choicest vegetables for table use.

CHAPTER XXXIII

RADISHES

A CONSIDERABLE quantity of Radishes is forced every Winter both for the market and for private use. As a commercial enterprise and with good demand, quick returns may be realized, for two crops may be gathered to one of Lettuce. Different methods have been recommended from time to time for producing Radishes under glass. They may be grown as a catch crop, sown between other growing crops, such as Lettuce, Cauliflower, etc., for they are ready to gather before the others are nearly matured. Many growers probably follow this plan, especially where the space is limited. But I do not approve of such mixed planting. In the first place, if each vegetable is growing in its own allotted space, the house will have a neater appearance; and while a few dollars may seemingly be saved by this double cropping, yet it will be at the expense of quality, for a crop that is allowed free scope will naturally develop better. I think that one good crop is preferable to two medium ones. In greenhouse culture the aim should be a perfect product. If mixed crops are grown in a garden we easily attribute any failure to climatic conditions, but the grower under glass has no such excuse, although he also is dependent on the sun during the Winter to firm up his crop.

Better Radishes can be produced in solid beds than on raised benches. A Lettuce temperature is ideal for Radishes, and a suitable soil liberally supplied with thoroughly decayed farmyard manure will promote rapid growth. Radishes will grow satisfactorily in Lettuce soil, though it may be a bit more sandy, and if rich in manure a much quicker growth will be obtained and roots more uniform in size. The soil must be free from insects or worms that eat into the roots. I am a strong advocate of hard, unleached wood ashes for all vegetables, particularly root crops. If these ashes are properly applied, there should be no occasion to complain of worms destroying the plants. Aside from keeping the insects in check, the ashes also improve the Radishes.

Radishes may be sown broadcast or in drills, preferably the latter, as it is much easier to keep them clean. For an indoor crop the best seed obtainable should be sown. Radish seed, when purchased, usually does not run even, but has a percentage of small seed, which will produce only small, inferior roots. Better results may be obtained if the smallest seed is separated by means of a fine screen; this will give an average strength of seed. With seed of high quality and germinating power it is not necessary to sow it so thick, for nearly every

seed may then be counted upon to respond. In this way, also, considerable time will be saved in thinning.

An important factor in Radish culture is the selection of varieties that are quick to mature, with good average-sized roots and not too much foliage. Any variety possessing these qualities may be used for forcing. Radishes may be sown in drills six or seven inches apart, and about one inch apart in the rows. I have seen Radishes left fairly thick in rows and not pulled until they are large enough for use, but in that case the quality will not be of the best, and the roots are liable to be old before they are full grown. The roots should be given full room for quick growth and free expansion. If they are permitted to remain in the soil after a certain stage, they get pithy and unfit for table use.

For a steady supply for the table, seed should be sown every week or ten days, in sufficient quantity to supply the demand. Radishes may also be sown in a seedbed and then transplanted. They will stand this treatment readily. I have grown them in this way, but I have come to the conclusion that the most satisfactory method is to sow the best seed obtainable in drills.

Radishes may be kept fairly moist from the time the seed is sown until maturity. They should be gathered at the proper stage of development, or while the roots are brittle and tender.

VARIETIES

The following varieties are excellent for forcing: Early Scarlet Forcing, Early Carmine, Scarlet Globe, Non Plus Ultra and French Breakfast. These can be relied upon, but others may be added if necessary, to suit individual tastes.

CHAPTER XXXIV

TOMATOES

PLANTING AND TRAINING—WATERING AND FEEDING—TEMPERATURES AND AIRING—SETTING THE FRUIT—TOMATOES AS A CATCH CROP—PREPARATIONS FOR SPRING CROP—INSECTS AND FUNGOUS DISEASES—VARIETIES

WE come now to a class of vegetables that require a warmer atmosphere, and in following cultural directions for this crop the grower should be governed by the season. For a Spring or early Summer crop solid beds are excellent. When the lettucehouse is beginning to get too warm for its own crop, nice thrifty Tomato plants, which have been grown in four-inch or five-inch pots, may be planted in the beds, where they will produce an excellent crop until the outdoor product comes into season. The adaptability of Tomatoes for forcing purposes has been known for years, and it is today one of the main Winter staple crops under glass, both for the market and for private purposes. As a forced vegetable (or fruit) the Tomato is peculiarly responsive to glass culture, bearing heavy crops of well-developed fruit, generally of better quality than can be grown in the open field or garden, unless the season for the latter is unusually favorable—that is, comparatively dry; the fruit is then more solid and firm. When grown under glass, the conditions can therefore be created that will give the best results. Aside from the advantage of having fresh fruit always at command, it is interesting to watch their development through the Winter months, the vines loaded down with their weight of fruit when everything outside is dormant.

Tomatoes are not difficult to handle under glass at any season. Of course, they will need much closer attention during the short days than on toward Spring and early Summer. I may as well, therefore, confine my remarks to Winter treatment. There is no difficulty, as a rule, in obtaining a rapid, luxuriant growth, but this is often more harmful than beneficial. Strong, thrifty vines are of great importance, but do not lose sight of the fact that we must also have a short-jointed, firm growth, rather than a soft, rapid development of vine and foliage. All plant life is, of course, benefited by a certain amount of nitrogen in the soil, but it should be used sparingly with Tomatoes, or we may get a rank growth at the expense of fruit. Combined with the proper treatment, potash and phosphoric acid are two important elements in building up the vines with the view to a plentiful supply of fruit, as I shall explain later.

The first requisite to be considered is a suitable house. The Tomato requires an abundance of sunlight, and any attempt to produce a satisfactory Winter crop without this will be but a partial success. Tomatoes may be grown successfully in any house during the Winter, if situated so as to get full benefit of the sun. It may be either a leanto, three-quarter span or span roof. Most of the houses erected now, however, are of the even span type, and, taking everything into consideration, this is the best for both Winter and Summer Tomatoes. The house may run either east and west or north and south; if the former, the plants are best set in rows crosswise north and south, thus allowing the sun to penetrate between the rows. Raised benches give the best results during the Winter months, for the soil will be warmer and the root action more lively; the beds will dry out oftener, and hence more feeding can be done. With outdoor crops the most prolific are generally obtained from medium, open soil, neither heavy nor too sandy—what I may call a medium loam. This is excellent also for the indoor beds, especially if secured from land where no vegetables have been growing before. Tomato compost may be prepared about a month before it is needed. To three or four loads of soil add one load of well-decayed manure, with bonemeal in the proportion of about a bushel to three wagon loads of soil. This should be sufficient to support the plants until they commence to bear fruit, when food may again be applied, according to the condition of the vines.

The plants should be started so as to obtain a good set of fruit before the dark, short days of Winter come—say by the end of October. The seed may be sown any time from the first to the middle of August in a pan or flat, according to the number of plants required. When large enough, transplant into other flats or into a prepared bed, or they may be potted into thumbpots and kept growing in pots up to four or five inches before being set in their fruiting quarters. This system may require a little more labor, but if the young plants are well cared for and kept thrifty and stocky, they will more than repay for it when set in the beds, and thrive much more satisfactorily.

PLANTING AND TRAINING

Soil four or five inches deep, on raised benches, is sufficient to produce a heavy crop, with systematic feeding. Before planting, it is well to consider the mode of training to be followed. For indoor culture the single stem system is to be preferred, especially for Winter forcing. The plants may be set in rows eighteen inches apart, leaving about two and one-half feet between the rows. Have a wire running parallel with the rows, about five feet above the bench. Then, as the plants need support, they can be stayed with six-foot wire rose stakes secured to the wire above. This arrangement will give a steady support, with very little trouble. Pinch off the side shoots as the plants put them forth, leaving but the one main shoot. If grown in this manner, they must be kept stocky and short-jointed, and to facilitate this, the soil in the benches should be thoroughly firmed down after planting. This is best done when it is on the dry side, or just before the plants need water.

WATERING AND FEEDING

Better results will be obtained through the Winter by keeping the plants slightly on the dry side. The best plan to follow is to give a thorough watering when needed and no more until absolutely necessary. The Tomato benches will often be dry on the surface, but so long as the foliage stands out boldly and seemingly full of sap, we can rest assured the plants are not suffering for want of moisture. It would, however, be a serious error to allow them to lack moisture at the roots. I also believe in growing them in a fairly dry, bracing atmosphere, as there is not much insect life to bother the vines, except white fly, which can be easily eradicated with hydrocyanic acid gas. Tomato vines do not need spraying from the time they are planted until through fruiting; then the vines are pulled out and replaced with young stock if necessary.

The feeding will depend on the weight of the fruit on the vines. With seed sown early in August, when everything has gone well there should be a heavy crop of fruit by the end of October or early in November—fruit that will ripen through December and January, and perhaps February. Apply food when there is a good set of young fruit on the vines; but it is far better to feed light and often than to give too much at one time. Tomato roots are easily damaged, but when they get accustomed to feeding, the strength of the application can be gradually increased. The main food should, however, be given for fruit development and firming up the wood. Potash and phosphoric acid or a good grade of Peruvian guano will afford good stimulation. But remember that the true Peruvian guano is powerful and should be used sparingly. In many cases a change of food is better than use of the same material time after time. Even a watering with liquid manure from the farm once or twice will not prove amiss.

Feeding depends largely on conditions. If the plants are in any way soft, it would be a mistake to use liquid manure; bonemeal is far better, or anything of that nature which will firm the growth, and at the same time assist the development and increase the weight of the fruit. Wonderful results may be obtained by systematic feeding at the proper time. The weather must also be consulted. Feeding is of no advantage in a long spell of dark, cloudy days, for it will then encourage too rank a growth, and this must be avoided. Many growers err more or less, at times, in overfeeding, and great harm may be thus done. I have learnt from many years of experience that it is better to feed light and often. Top dressing seems to put new life and energy into the vines. Room should be left for about an inch of new soil, to be applied after the vines have a liberal set of fruit. This will assist the development and encourage root action, especially if a seven-inch pot full of Ichthemic guano per wheelbarrow load of soil is added, with a sprinkling of bonemeal.

TEMPERATURES AND AIRING

Proper regulation of temperature and airing may seem a simple matter, and such it is to the skilled grower, but carelessness in these points will counteract all otherwise good work. The Tomato vine, as I have said, must make a

firm, solid growth, and while this may be induced by the proper food, proper temperature and ventilation are also of assistance in bringing about the desired results. The one is just as important as the other.

Tomatoes may be classed as a warm-blooded vegetable and need a certain amount of heat to keep them growing in a thrifty condition, but, like all other plants, they want an abundance of fresh air. If kept in a close, humid atmosphere, the most liberal feeding will not prevent them from producing long-jointed, soft growth, and the same will happen if they are kept too warm both day and night. While a temperature of 65° by night and correspondingly higher by day will induce a much quicker growth, the crop will fall short in weight, size, solidity and color. High temperatures, furthermore, are favorable to mildew and many other diseases that attack the Tomato vine. A steady Winter temperature of 60° by night and 70° or 75° with sun by day, with a fair portion of air on, is sufficient; nothing is gained by having it higher. As the temperature advances in the morning, or when the thermometer registers 65°, admit a crack of air, and increase steadily as the mercury goes up. It is a serious mistake to wait until the house gets overheated and then open the vents all at once. No good results can be expected with such treatment. The temperature and airing require thought and good judgment. In the Fall, when the nights are getting a bit cold, it is much better to send a little heat through the pipes and leave a crack of air on. Closing down tight all the time without some fire heat, would cause the humidity in the house to condense and fall on the foliage, inducing mildew and other diseases; and if this trouble once makes headway, it is difficult to eradicate. Careful adjustment of the ventilators, with a steady temperature and a fairly dry, bracing atmosphere, will be found the best means of guarding against the diseases that the Tomato under glass is subject to.

SETTING THE FRUIT

In order to secure a good set of fruit, it is necessary to pollinate the blossoms; this is a simple operation, but it must be attended to faithfully. Imperfectly set fruit will not develop satisfactorily; it will be either deformed, or will refuse absolutely to swell. When the blossoms are ready for pollinating, in a dry, bracing atmosphere, merely a gentle tap should dislodge the pollen. There are different methods in use. I prefer to tap the vine lightly with one hand, catching the pollen on my finger, and then bringing the pistil gently in touch with it; in this way all the blossoms can be gone over rapidly. The main point is, to have the pollen dry, so that it will distribute itself freely. About noon on a bright day is the time most suitable for the operation. Blossoms treated then will swell away more rapidly. Toward Spring, when the days lengthen and the sun becomes more powerful, these precautions are not so necessary, and a light tapping of the vines is sufficient. Here, again, there is a decided advantage in having a firm, stocky growth, for such vines will produce a plentiful supply of pollen, and there will be no difficulty in obtaining a heavy set of fruit; whereas if the blossoms are weak, on soft, long-jointed vines, there will be very little pollen to work with. Such conditions are most discouraging.

TOMATO ROCHFORD

The photograph represents a Midwinter crop growing on raised benches. During the short days this healthful vegetable is greatly appreciated

TOMATOES AS A CATCH CROP

There are many private establishments that do not set aside a special house for this important crop. A batch may very well be grown in any other house where a suitable temperature can be maintained, with full sunlight. I have seen excellent Tomatoes grown in boxes about eight inches wide, six inches deep and long enough to accommodate three or four plants. They may even be grown along in pots, up to eleven or twelve inches for fruiting, and quite a good crop may be had in this way. Tomatoes can be highly recommended for this mode of culture. A rosehouse temperature is excellent. The only difference in treatment, especially with the pot plants, is that they require perhaps a little more food.

PREPARATIONS FOR SPRING CROP

When growing Tomatoes by the single stem system, plants that have been cropping during the late Fall and Winter are about played out by the end of February. Young plants in four- or five-inch pots should therefore be ready to replace the old ones; these may be obtained either from cuttings or from seed. I decidedly prefer the latter, for the seedlings seem to grow more evenly. In order to have these young plants ready by the end of February or the first of March, the seed should be sown in January, for their progress is slow in the Winter months. Keep the plants near the glass, to keep them from becoming spindly. It is also advisable to replenish the soil on a raised bench, as the roots from the old vines will have penetrated through. While fairly good fruit may be grown by working some manure into the old beds before planting again, yet a finer crop will be assured by renewing the soil. For a Spring crop, however, solid beds can be relied upon to yield a heavy crop. Tomatoes planted in solid beds from the Spring onward will not require the same close attention as those produced on raised benches. Such conditions are ideal for late Spring and early Summer cropping.

INSECTS AND FUNGOUS DISEASES

The Tomato under glass, especially when grown in any way soft, is easily attacked by different diseases; but these may be kept down by following the instructions given as to careful airing and steady temperature, with a dry, bracing atmosphere at night. If the vines are once attacked, the disease will spread rapidly. Tomato rust or mildew appears in the form of fungus patches on the under side of the leaf, and this alone will ruin a crop in a short time. This growth must be checked as soon as it is detected; any of the fungicide mixtures will do the work, but it is well to select one that will not disfigure the white paint of the house. Copper solution is about as effective as anything else, and leaves but few marks behind. These remedies must be used carefully, for the Tomato foliage is very easily burnt, and even the copper solution should be made weaker than the directions call for.

Fruit rot is at times a bit troublesome, but I think it is due more or less to uneven temperature in the early Fall. This we cannot control, for we may get, even in the late Fall, a few extremely hot days. However this may be, we know that the trouble will disappear as soon as we can keep up a fairly steady temperature. The only remedy that I can suggest is to gather up the diseased fruit and burn or bury it. Where clubroot is troublesome, the soil may be sterilized; but when Tomatoes are affected either by blight or clubroot, it is useless to waste any time on them.

White fly will spread rapidly if allowed to go unchecked. It was difficult to eradicate before the time of hydrocyanic acid gas, for none of the tobacco concoctions affect it to any extent, either in liquid form or by fumigating; but a very mild dose of gas will destroy them. One-half ounce of cyanide for every 1000 cubic feet of space—using 50% cyanide—is sufficient to kill white fly, with no harm to the vines. If the cyanide is over 50%, use less than one-half ounce, and follow the directions given for the fumigation of Lettuce.

VARIETIES

Of varieties that are adapted for inside work there are quite a number. A few points should be noted here before making a selection. A Tomato intended for forcing should be solid, with good color, and should be above all a free setter. Some fifteen or twenty years ago the Lorillard Tomato combined all these qualities, but for some reason it did not retain them and hence lost its place as a forcing Tomato. The following varieties will respond to Winter forcing, and while some others might be added, nothing is gained by growing many varieties under glass. The question resolves itself into selecting a few of the best, which are: Rochford, The Don, Comet, Sutton's Winter Beauty, Sutton's Earliest of All, Sutton's Best of All, and Stirling Castle. The last named is a bit under size, but has well shaped fruit and good setting qualities.

CHAPTER XXXV

CUCUMBERS

ACCORDING to ancient writers, the Cucumber has been cultivated since the earliest ages and has always been esteemed as a table luxury. In recent years forcing through the Winter months has advanced by leaps and bounds, more so commercially than for private purposes, though most private establishments now include Cucumbers among their forcing vegetables. In former years the demand for a regular supply at all times was not so keen, but now they are a necessity through the shortest days, as well as in the late Fall and early Spring. While they require more strict attention in the way of treatment in the Winter months, and are more expensive to produce, yet there is then the most brisk demand, and the best prices can be obtained.

Whatever the season of the year, the crop must be kept growing along without a check. If once stunted it is difficult to get the Cucumber into good condition again. The White Spine types are those chiefly grown for the market, while many of the private places prefer the English or Telegraph strain. Both of these are worthy of consideration, and are excellent for forcing purposes. The Telegraph would probably be grown still more extensively were it not that they require a somewhat higher temperature for the best results; if produced under favorable conditions the weight of fruit that they yield is astonishing, but as they are not grown commercially to any extent, their good qualities are not so widely known as those of the White Spine varieties. Decided improvement has been made in recent years with both types as to size, shape, high quality and, above all, productiveness, so that now we have a splendid selection for growing under glass.

Good, thoroughly ripened, carefully selected seed is the first requisite for success. The seedsmen in this country are doing good work in sending out improved, substantial seed material, with strong germinating power, that will insure an abundant crop, under suitable treatment.

Cucumbers are grown both in solid beds and in raised benches; the latter are preferable for Winter forcing. For the short days it is not necessary to have a large body of soil. Equal success may be obtained in different kinds of houses, ranging from the mammoth commercial establishment to a house fourteen or fifteen feet wide. The demands to be supplied will govern the size of the house. For private use a span house about fourteen feet wide will be sufficient. The vines may be trained on vertical wires, though a trellis about a foot from the glass

is more desirable; the Telegraph types, in fact, should not be trained in any other way, and the English varieties also will not withstand the same amount of sun as the White Spine. Toward Spring, therefore, when the sun becomes more powerful, a light shade should be used—just enough to break the sun's rays without darkening the house.

The soil is an important item and it should be carefully selected. The vines should make a quick, healthy growth; for this there must be free root action and the compost should be of such a nature that the roots will rapidly penetrate through it. Stagnant root action is a serious drawback. Sod land soil is the best, prepared about a month before being required. The nature of the soil will determine the materials to be added so as to get the best root action. If it is heavy, add a liberal quantity of leaf soil, and even thoroughly decayed manure. It is not easy to give definite rules as to soil, for even men of wide experience may err on this point. The soil in different places will act differently, and it will sometimes take several months or a year for a grower in a new place to learn just how to handle his soil to the best advantage.

SOWING SEED AND CARE OF YOUNG PLANTS

The seed may be sown at any time from the first to the middle of August. I prefer small pots for the purpose, with a compost of loam and leaf soil, but no manure. Fill the pots to within an inch of the top, pressing it moderately firm; then place a couple of seeds in each pot and cover with one-half inch of soil. Give a light watering and cover the pots, or if there are not many, place them in a flat and cover the same with a piece of glass, with heavy paper on top, to prevent the sun from striking through. If they are kept in a close, dark place until germination, they will not need any watering after the first application until germination takes place; when the seedlings break through the soil they must be brought into the light. There will be no difficulty in raising young plants during August, as the surroundings are warm; but in the Winter months a fairly brisk heat is necessary; a temperature of 75° is advisable. Grow the seedlings along in pots up to about five inches. They should then be strong, thrifty young plants, in condition to grow rapidly when set in their fruiting quarters. The weather in the early Fall is usually fine for a free, rapid, healthy growth. The Cucumbers should be ready to gather by the first of November. It is not well to allow the vines to carry a heavy crop until they are fairly strong. The White Spine types will begin fruiting ahead of the Telegraph varieties.

For Cucumbers grown on raised benches, it is not advisable to have a large quantity of soil at the first planting. If they are to be trained up the roof, they may be planted along the bench about three feet apart, preferably on mounds; then as the roots penetrate through the compost, add more soil. This will induce a lively root action, with a strong, vigorous growth. I do not recommend a large body of soil for carrying Cucumbers through the short days; it is better to depend on feeding. Soil to fill a space two feet wide and five inches deep will be sufficient to carry a heavy crop. Where Cucumbers are grown in a wide house,

they should be planted in rows and trained to vertical wires; set the plants three feet apart, and have the rows five or six feet apart.

WATERING—FEEDING

Cucumbers delight in an abundance of moisture in the atmosphere, particularly so after the fires have been started. Nor should they suffer for want of moisture at the roots; but they must not be watered to the extent of souring the soil, or the roots will decay. If they are kept a bit drier at the roots before beginning to bear fruit, the vines will be in better condition to carry a heavier crop. A good rule for this, as for all other vegetables under glass, is to give a good watering once and no more until necessary.

Feeding will be in order when the vines are carrying a heavy crop. Manure water from the cow barn is excellent for producing a good vine and foliage. But food should also be given with a view to improving fruit, such as bone and potash. Cucumbers will take more nitrogen and less potash and phosphoric acid than many other crops; still these ingredients are necessary to all fruit-bearing plants. A cucumberhouse in full crop is a handsome sight, and with systematic feeding the vines will bear or produce Cucumbers for a long time. The exact duration of a crop is hard to foretell, as it depends largely on the condition of the vine. As long as they are hung full with fruit, it would be folly to disturb them, but whenever the vines show signs of deterioration, it is better to discard them and start afresh with young plants. The soil should then be renewed, for it is merely a waste of time to try to recuperate Cucumbers when they once begin to get stunted or worn out.

AIRING—TEMPERATURE

Cucumbers are very exacting as to airing and temperature, and any neglect or oversight in these matters will react upon the plants. The temperature best suited to them is 65° by night and 75° or 80° with sun by day. Admit a crack of air when the thermometer registers about 72°. Even then good judgment must be exercised, and it would be well to admit the air on the opposite side. If there is a brisk south wind blowing admit a crack of air on the opposite side. There is nothing worse than a cold, cutting wind blowing directly on the vines; in fact, they will not stand it during the short days, especially the Telegraph strain, which is somewhat more delicate than the White Spine variety. The latter may be grown successfully in a somewhat lower temperature. It must be borne in mind that both kinds are sensitive to sudden changes. Therefore, a steady temperature must be maintained and the airing done carefully. The atmosphere must be kept sufficiently moist, and the foliage may be sprayed a couple of times a day in bright weather. With such treatment the vines should not be sick or puny, nor be troubled with insects, which will always attack a plant that is checked through carelessness or neglect.

CUCUMBER IMPROVED TELEGRAPH

A batch of Cucumbers grown in boxes—proof sufficient to convince anyone that this crop may be cultivated successfully during the Winter with a small body of soil

TRAINING AND PRUNING

The Cucumber is naturally a rapid grower, and if allowed to go unrestrained it will soon be beyond control. Considerable pinching and pruning are necessary. We pinch both to produce fruit and to keep the vines within bounds, and the same applies to pruning. Whenever the foliage gets crowded remove some of the weaker and older growths, to allow room for tying in the young growths. Nothing is gained by crowding. One well-developed leaf is better than two poor ones. The young vines may be allowed to grow up to four or five feet before pinching out the center; the lead being thus checked, lateral growths will come from the axils of each leaf, and the fruit will form from these laterals. If the vines are strong enough to carry the first lot of fruit that appears, it may remain, but it is not well to allow them to bear fruit until strong enough to withstand the strain. Many a promising house has been damaged more or less by such an error. Nothing is gained by very early cropping; it seems to be, on the contrary, a disadvantage.

The trellis should be covered with foliage, but not crowded. Pinch one leaf beyond the fruit, and in a short time growths will extend again from the shoots that have been pinched, with a showing of fruit, which should again be pinched one leaf beyond. By this method there will be a continuous supply of Cucumbers.

If the vines and foliage are overcrowded, they must be pruned. Cut away as much of the old vine as possible, to make room for the young growths, as we have to depend on this for our constant supply of fruit. Do not relieve the vines of too large a quantity of foliage at once, for this has a tendency to check them. It is much safer to remove the surplus foliage by degrees. Cucumber vines will occasionally produce far more fruit than they should be allowed to carry, especially the Telegraph types, and in such cases it is better to pinch some off.

SETTING THE FRUIT

The Cucumber bears both male and female flowers, like the Melon, but, unlike the latter, it need not be fertilized. Cucumbers may be grown successfully without any fertilization whatever, especially the Telegraph strain. But if seed is wanted for reproduction, the female flower must be fertilized with the male; if no seed is required, I prefer to grow the Telegraph strain without any fertilization whatever. The White Spine types may also be grown in this manner, but they will swell more evenly if fertilized. Where a large quantity is grown, bees are better for this work than anything else.

The Cucumber crop is not bothered with many insects. Green fly may appear once in a while, but an occasional light fumigation will keep it in check. Nico-Fume is good for this purpose. Mildew or spot on the foliage is far more serious than fly, and much more difficult to eradicate; but if the ventilators are regulated properly and a congenial atmosphere is maintained, there is no occasion for mildew or spot on the foliage. This disease is usually brought about by uneven temperatures, or perhaps by too cold nights, both conditions

being unfavorable to a healthy growth. When this disease once gets into a house, it seems almost impossible to bring the vines back into a healthy state, and it is probably a waste of time to attempt to do so. The best advice I can give is to pull up the vines and make a fresh start.

VARIETIES

The list of Cucumbers advertised is a long one, and has been so for many years. A trial of 118 varieties was made at Chiswick, England, in 1861, and out of this number the Fruit Committee selected, I believe, fifteen for growing under glass. It is not necessary to have a long list for this purpose; it is better to depend on those kinds that will respond most freely and give the best results. Nearly all will withstand forcing.

Of the White Spine types Rawson's Hot House is the leader, and this can safely be relied upon as the mainstay of the house. Any of the White Spine types will force readily.

Among the English varieties Telegraph has been popular for many years. The true strain of Improved Telegraph is one of the very best all-around varieties for Winter forcing. The illustration on page 229 plainly shows the free fruiting qualities of Improved Telegraph; this photograph was taken in Midwinter. Among other prolific bearers are Sutton's Delicacy, Sutton's Satisfaction, Rochford's Market, Tender and True, Sutton's Everyday; all of these may be relied upon to produce abundant crops. I could add many more, but I do not think that a long list is necessary for forcing Cucumbers under glass.

Crop of Mushrooms One Month After Bed was Spawned with Pure Culture Spawn

Since the advent of Pure Culture Spawn some years ago, it has gradually gained preference over all others on account of its quick action,.

CHAPTER XXXVI

MUSHROOMS

MUSHROOM growing, if done successfully, is a profitable enterprise. Much has been written by experienced growers in regard to the cultivation of this important crop, but every one of them probably has some failures to record along with his successes. I have grown Mushrooms for many years, and I know, from sad experience, that one bed may give entire satisfaction, while another, a few weeks later, may be a failure, with exactly the same treatment, seemingly. Such variation is difficult to explain. Some wonderfully successful crops of Mushrooms have been grown artificially, and there have been, doubtless, failures just as remarkable.

The cultivation of Mushrooms is, however, interesting work, all the more so on account of the uncertainty attending it. The Mushroom bed is probably watched as carefully as any other crop grown artificially. When we first see the weblike spawn working, spreading through the soil, we feel encouraged, but not until four or five weeks after spawning, when the Mushrooms are breaking through, do we have any certainty that our labors will be rewarded. A successful crop is largely dependent on conditions. We may see Mushrooms growing in all conceivable places—in cellars, under greenhouse benches, and in houses especially built for them, though there may be many a mushroom-house not up to the requirements of the plant or fungus. The essential point is to bring the crop along without adding much water to the beds. Where they dry out often and much watering is required, the result in most cases is failure. It seems a simple matter to give directions for preparing a Mushroom bed. If we hear of a grower who has wonderful success year after year, we may be certain that the situation of his beds is ideal for the purpose While it is necessary to be familiar with the culture of this crop, yet the man who strikes the conditions agreeable to it is fortunate; with good treatment his failures will be few. Anyone who has grown Mushrooms in one place only will not realize the force of this argument, while those who have had experience in growing them in different houses will appreciate it.

Some years ago I had, for several seasons, charge of a house in which a failure was rare; the Mushrooms always made a healthy growth. I confess that I was successful enough to get a bit conceited, thinking that I had become perfect in the art of producing a bountiful crop of Mushrooms year after year, taking all the credit to myself and giving none to the surroundings. But Jo and

behold! in time I went to another place, where I also was in charge of a mushroomhouse, and here I had more failure than success; in fact, my work was a failure from beginning to end—so much so that in a few years we gave up further attempts. I then realized that my previous successes were due more to the house than to my own skill.

Of two houses that are apparently alike, one may dry out much more rapidly than the other. The best success is obtained where a house is built into a bank, with natural soil overhead, or rather, natural soil above the brick arches. Such a location requires very little artificial heat to keep up the proper temperature, and a certain amount of ventilation is all that is necessary. In a house of this nature the heating pipes should be rather small, and so arranged that each may be turned on separately, as needed.

There are two modes of preparing the manure for successful Mushroom growing. The one generally used is to secure fresh horse manure from grain fed horses; manure that has been lying around for any length of time and has become heated almost up to a state of burning, is practically useless. The quantity of manure depends on the size of the house. Large growers can procure it in carload lots, while private establishments may get fresh manure from the horse stable every morning until sufficient is collected to make a bed of the desired size. This manure should be placed in an open shed and turned over once a day for a few days, when loam may be added, in the proportion of one wheelbarrow of loam to six of manure. The loam seems to assist the spawn in working better through the bed. Two or three days after adding the soil the manure should be in condition to be placed in the bed. Here good judgment is necessary. The manure should be neither too dry nor too wet, for in either case it might kill the spawn. It often needs a light watering before the bed is made; it should be moist but not saturated. A good way to test it is to take up a handful and squeeze it; there should be just enough moisture to keep the material together with no surplus water running off under the pressure. Manure in this condition is about right for a healthy growth of spawn. It should be placed in the bed in layers and thoroughly firmed down by tramping with the feet or pounding with wooden mallets, so as to produce a solid foundation. Mushrooms will not be a success when the manure is soft and spongy. The bed should not be too shallow; ten to twelve inches is not any too deep if it is to last any length of time.

If the manure was in good condition, the thermometer will likely reach 100° in the bed within a few days, probably more; spawn must not be inserted until the heat has receded to 80° or 90°. English spawn may be put in when the heat is just below 90°, while Pure Culture spawn may be put in at 80°. Insert it in the bed about three or four inches deep and about five inches apart each way, using pieces about the size of a walnut. Then firm the manure down again thoroughly. In about a week or ten days place two inches of good maiden loam over the bed. This also should be in a moist condition, or in such shape that it will pack down fairly solid with the back of the spade. If the beds are made firm, they will not dry out so quickly and less water will be needed. A quick drying out of the beds is injurious to the healthy development of the Mushrooms, but if the manure gets dry, the bed must be watered. The temperature of the

water should be 75° or 80°. After the soil has been placed on the beds, it is well to cover them with hay or straw, say about an inch in thickness, as a prevention against rapid evaporation, until the Mushrooms start to come through, when the material should be removed.

I am often asked what time elapses between spawning and the gathering of the Mushrooms. I cannot answer this question with any degree of certainty. I have gathered Mushrooms within five weeks of spawning, and at other times I have had to wait considerably longer. Why this should be so is difficult to explain. Two theories have been advanced to account for it. In the first place, manure and moisture must work together just right for the quick action of spawn; then, again, we may be fortunate at times in securing spawn with more life in it. If we have gathered one rousing crop, we naturally try to make the next bed just like it. There is probably more elation over a successful crop of Mushrooms than over any other crop.

The habit of this fungus when grown by Nature's unaided efforts shows plainly that it delights in an atmosphere charged with moisture. In the latter part of September, when dews are prevalent, the Mushrooms may be seen pushing their way through the pasture land. While the sod may often be dry, the dampness in the air from the fogs during the night and morning calls them forth. Therefore, when we grow them artificially, we should keep up a fairly moist, humid atmosphere, and this may be done by keeping the walls and walks moist.

When the first crop is gathered, a little fresh soil may be added to the bed, with watering if necessary, and a light application of soda, and the chances are that a new crop will appear within a short time. But this depends on circumstances. Some beds may be kept lively for at least three months, while others will not last half that time. No rules can be laid down here but the one: hold on to a bed as long as it is profitable to do so, whether it is for two months or four months.

Judgment should be used in gathering, for serious damage may be done by carelessness. The best way is to take each Mushroom separately, and pull rather than cut it; if it is twisted gently off its stem, the young, undeveloped ones near it will not be disturbed.

Having described the general method of culture, I will add a few words as to my own method. Get the manure fresh from the stable and add about one-half of old Mushroom manure, or enough to prevent burning. Mix the two thoroughly; leave the mixture in a pile for one day and then make the bed. The moisture in both manures should be about equal. Made in this way beds will hold the moisture perhaps longer than when made in the way above mentioned and it is certainly a saving of time and labor. I have grown many successful crops in such beds and have not found them inferior to any others. With the proper Mushroom temperature, congenial atmospheric conditions and a due amount of care, there is no occasion for failure.

Proper temperature is an important matter. Mushrooms will thrive splendidly in 55°, or if kept at 60° when the spawn first begins to run, which can be detected by its weblike appearance spreading all over the surface, it would be

well then to gradually drop to 55° as the Mushrooms begin to appear. They may develop somewhat more slowly at this degree, but will more than make up for the time in solidity and weight.

It is curious that while the culture of Mushrooms is so very simple, with but few details to note, it is more or less often a failure. This may be due to different causes. Here is an instance from my own experience. Some years ago two lots of spawn, secured from two different places, were used in a bed. The result was that one-half of the crop was satisfactory while the other half was a complete failure. This was sure enough proof that the failure was due to poor spawn. However, houses handling Mushroom spawn are, as a rule, particular as to its quality, since they know well enough the importance of fresh spawn.

Until recent years Mushroom growers relied mainly upon the English Mill Tract spawn, and this is still used by many; but there has been much less demand for it since the introduction of the Pure Culture spawn. This latter has made many friends because of its productivity, growing heavy Mushrooms in large clusters. It is, however, decidedly more prolific by spawning in a temperature five degrees lower than that recommended for the English spawn. Either kind may be relied upon to give satisfaction if the surroundings are adapted to a healthy growth, and this cannot be obtained in a house which dries out too quickly.

CHAPTER XXXVII

RHUBARB

THE popular demand for Rhubarb, both in and out of season, is steadily increasing, and the hothouse production is keeping pace with this demand. The readiness with which Rhubarb responds to forcing has been recognized for many years, and no wonder, since the plant is not pretentious as to its surroundings. It will grow in the dark as well as in the light, under the bench or wherever else convenient, provided it gets the proper amount of moisture and heat. It will also produce growth in various temperatures, ranging from 50° to 70°, the only difference being that the stalks will be a bit more spindly if grown very warm. From 55° to 60° will give the best results, and more may be got out of the crowns with a moderate heat than if they are rushed along too fast.

Different methods are used in bringing this crop along out of season. In private establishments the roots are generally dug up in the Fall and brought into heat from the latter part of December on, about two or three weeks apart, according to requirements. After the roots have gone through this forcing process, they are useless for further planting. Where Rhubarb is to be forced year after year, new stock will have to be obtained either by division of old stock or by seed. Rhubarb beds are improved, after being planted four or five years in one place, if they are lifted and the crowns divided; but Rhubarb is more generally increased by sowing a little seed each year.

Where it is grown commercially on a large scale, roughly constructed houses are used. These are built over the beds, in which plants have previously been growing two and one-half feet apart, and have been cut down by frost. Rough boards are used for the sides and ends, lined with paper as a protection, while the roof may be made up of any ordinary sash. This mode of construction is, of course, only advisable when the plant is grown on a large scale. A house of this kind may be twenty-five feet wide or more and of any desired length. Either steam or hot water may be used to keep up the necessary temperature. A steam plant is the cheapest to put in. This method can only be recommended when grown on an extensive scale for market purposes, the advantage of this method being that the roots will not be disturbed, hence a heavier crop may be expected.

The main factor in successful Rhubarb forcing, whether the plants are dug up or forced where they stand in the ground, is a strong, healthy root. It is useless to attempt to force any roots that are not robust and healthy. While Rhubarb is hardy and will withstand considerable rough treatment, yet, like

all other vegetables, it will respond to good culture, and the successful grower will be liberal with manure. A good batch of thrifty Rhubarb in the forcing house during the Winter or early Spring is a pleasant sight, and the man who brings it along in this condition deserves all credit. Yet the material in those crowns must be stored up before they are subjected to the forcing process. The crowns may be brought to the proper condition by good cultivation and a liberal supply of farmyard manure; it is impossible to produce a strong growth in impoverished soil. As I have said, the general method of increasing stock is by seed; but we may occasionally have an excellent strain that is very productive, in which case the stock should be kept up by division when it gets to be four or five years old and has grown a goodly number of crowns. They may then be divided and replanted again. When increased by seed, part of the crop will often be found coarse and undesirable.

Forced Rhubarb is very delicate in appearance, especially when grown in the dark; it will thrive here equally as well as in the light, the only difference being less leaf and longer stalks; the acidity is also diminished, though there is still enough to give the true Rhubarb flavor. Less sweetening will be required to make it palatable and this is a point in its favor as against the outdoor product.

In selecting plants with extra strong crowns for forcing purposes, far better results will be obtained when the foliage has died down and before hard freezing sets in. Enough roots should be dug up to carry through the forcing season. In regard to quantity—every one will be governed according to demand, although in digging up those roots one should secure all the roots possible; also leave as much soil as will remain among the fibrous roots. It is absolutely necessary for best results to allow those roots to go through a freezing process before they are placed in their forcing quarters; better results will then be obtained, as the crowns will throw up more freely when Nature has done her part in freezing them. The roots may be allowed to stay in the open, but when frozen they should be staked in piles and covered with long manure to prevent constant freezing and thawing; roots then can be selected for the forcing house whenever needed. Any time in December a batch of roots may be put into heat, either under a greenhouse bench, where a minimum temperature of 55° to 60° can be maintained, or in a mushroomhouse; Rhubarb will thrive splendidly in either of these locations. The roots should be placed close together, filling in the open, hollow spaces between them with soil, leaf mould or anything else that will hold moisture.

Enough material should be used to cover the roots, and also the crowns slightly. Very little watering is required until the growth commences, when the plants should be kept fairly moist. A constant supply may be had by bringing fresh roots into heat every three weeks, from Christmas until the outdoor product comes around again. It takes very little labor and attention to furnish this healthful table delicacy. No doubt there have been failures in this crop due to bad selection of old roots, which are not suited for forcing. Plants three years old are of just the right age, if they have been under good culture in rich soil. Older plants may also be used, but they will be slower in starting into growth, and the stalks will be much smaller. The best roots possible should be obtained,

for herein lies the main secret of success in forcing Rhubarb that will please both the grower and the consumer.

As the process of raising this crop artificially is so very simple, anyone with little or no experience may undertake it and feel reasonably sure of success. It is not even necessary to have a greenhouse or mushroomhouse. I have seen excellent stalks produced in a cellar with a temperature of 50° to 55°, the plants being placed in a corner where they could be supplied with moisture. What other plant is there which will put up with such varying conditions and produce a successful crop? There is really no reason why it should not be more generally forced even than it is now. All the varieties will submit to forcing. W. W. Rawson, of Boston, recommends Burbank's Winter Crimson for forcing; this, from so high an authority, deserves to be noted. Among the others that may be relied upon are Mitchell's Royal Albert and Myatt's Victoria. Taking any desired variety, the most important point is to have vigorous plants.

CHAPTER XXXVIII

ASPARAGUS

ASPARAGUS forces as readily as Rhubarb, and the operation is equally simple. While it is probably not forced to any great extent, yet it is most acceptable during the Winter. It would be folly to rely on old, exhausted beds and expect them to produce satisfactory results, for the best we could get out of them would be a quantity of small, spindly shoots. The mode of culture generally adopted in private establishments with a system for Winter vegetables, is as follows: Before hard freezing sets in in late Fall, the number of crowns necessary are lifted, selecting good, thrifty, robust roots, preferably not over three or four years old, for older crowns are difficult to remove on account of their tangled mass of roots. They must be lifted carefully, with as much soil as possible adhering to the roots. For Asparagus at Christmas they should be brought into heat three weeks in advance. It is best to put them in a position where they receive a certain amount of light, perhaps under a greenhouse bench with a temperature of about 60°. Place the roots close together, run a four-inch board along the sides and put on light soil, filling in all the hollow spaces with enough to cover the crowns two or three inches; give a good watering to settle the soil well around the roots. The returns will be quick, and if the batch is carefully handled, it will last quite a while. Where a supply is to be kept up, another batch must be brought in within three or four weeks. Plants that are dug up for forcing may remain out in the open and be brought into heat as needed. Pile them up and cover the roots with soil and leaves or light manure on the outside, according to the weather. This method will give free access to the roots at all times. In any case, the roots must be protected or covered so as to keep in the moisture.

Excellent Asparagus may also be brought along in frames, especially if there are hot water pipes. Even a hotbed of manure will answer, otherwise the soil will be cold and progress slow. Bottom heat of 60° to 70° will bring it along nicely. At the same time, it is not well to depend entirely on the hotbed; there should be some artificial heat in reserve. When the roots are dug up for forcing, they get a considerable check, even though they be lifted carefully, and the shoots will not be equal in quality to those of undisturbed roots. It is, moreover, a sacrifice to a certain extent, for the crowns are useless after having been forced; but there are times when sacrifices are not to be considered so long as certain results are obtained.

Much finer shoots may probably be obtained by following the method of the commercial Rhubarb establishment: Construct a rough house over a bed planted with that end in view. This is a good plan where a large supply is needed; but it is not necessary for private use, if the roots are grown nearby, so that they are not handled much; the method of lifting the roots and bringing them in as needed cannot well be improved upon.

The forcing of Asparagus is very simple, as compared with that of other vegetables, although the shoots are sometimes not of the highest grade. In

ASPARAGUS

The story of forced Asparagus is told in this picture, showing the delicate, succulent, young growths almost ready for use

order to obtain the best results, the utmost care must be exercised in handling the roots before they go into heat. If the soil where they are growing is of such nature that a quantity can remain with the crowns, the growth will start much stronger and yield a steady cut for a longer time. These roots should be forced in a moderate temperature. Out in the open beds it is one of the first vegetables to be gathered, showing plainly that it does not need a great amount of heat to start into growth.

I have seen Asparagus roots forced in the mushroomhouse, but while the growth may come along all right, flavor is not the same as when more light is given. Different methods have been used in former years for growing Asparagus out of season. It has even been planted in beds, with space enough between the

beds for a trench eighteen to twenty inches wide, which was filled with stable manure, or half manure and half leaves; then frames were placed over the beds and the manure brought up level with the top of the frames. This may be done near large cities, where the manure can generally be had in quantity. I think this method of producing early Asparagus was followed on a large scale years ago in the suburbs of Paris, France, and excellent crops were undoubtedly produced; but the handling of such large bulks of manure involves considerable labor. With us here it is a question of getting the largest results with the least outlay of labor, and this is best done by forcing lifted plants, although they may be useless afterward and are therefore a loss. But aside from this disadvantage, Asparagus does not require much labor and hardly any coal, as it may be forced under a bench of other crops, in space that is not needed for anything else. So taking everything into consideration it is not an expensive crop. Any of the standard varieties will submit to the forcing process.

CHAPTER XXXIX

CARROTS—BEETS—STRING BEANS

YOUNG Carrots are often in demand and may be had with little trouble. I have also seen good Carrots grown in frames with artificial heat. The best sorts for forcing are the Early Short Horn types. For a supply of young Carrots during the Winter, a sowing may be made once a month, from about November. The dwarf forcing varieties, which will not produce much top, may be sown in drills six inches apart, and when the seedlings are large enough, thin to about one inch apart in the rows.

These early forcing Carrots may be grown either on raised benches or in solid beds. They want a fairly loose, rich, warm, friable soil for quick growth, with a steady, even temperature. They may also be grown under lettuce or tomatohouse conditions, but whatever temperature they have become accustomed to should be followed up. There is nothing better for enriching the soil than good farmyard manure thoroughly decayed, with a fair coat of wood ashes worked into the soil. Carrot land is improved somewhat with nitrogen and also where potash is available.

A considerable quantity of roots may be got out of a comparatively small space, and, fortunately, there are no insect pests or diseases to bother them Toward Spring excellent Carrots can be grown in regular hotbeds, although it is not advisable to attempt too early a start, at least not until the grower is reasonably sure of maintaining a suitable temperature. From about the first of March Carrots will make a good, healthy growth where the temperature of the soil can be maintained at about 60°.

BEETS

Beets require exactly the same treatment as to heat, soil, etc., the only difference being that as they produce more top, more space is required for development. They may be sown in drills one foot apart and thinned in the rows to two or three inches. Another method, by which space may be saved, is to sow the Beet seed in flats and then transplant into the beds. The earliest maturing varieties should be selected for growing under glass.

Beets and Carrots are not forced to any extent; but the young, fresh grown roots are far superior to the stored crops, by which the Winter demands are generally supplied. Vegetables that adapt themselves to forcing are certain to give

general satisfaction. With many of them the labor is trifling as compared with that bestowed on other products of the forcing process. A house devoted to vegetables, when kept fully stocked with growing crops, will yield a large supply.

CARROTS

A type of Carrots best adapted for forcing purposes. One should always aim to select the very earliest and quickest maturing varieties for this work

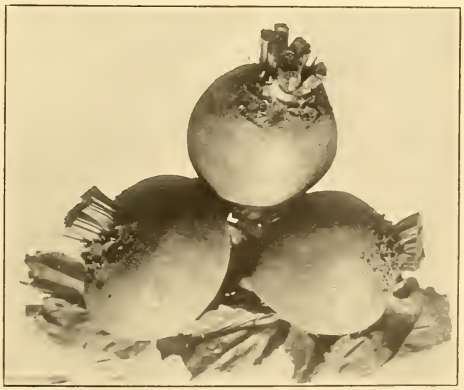
STRING BEANS

Beans are easily forced during the Winter, and in private places where choice vegetables are in demand they are highly appreciated, as they are far superior to any that can be procured in the open market. If they are grown inside, they do not receive any check; they get the heat and moisture suited to their best development, and are tender and of rich flavor. Furthermore, they are not exacting as to temperature, although the most satisfactory is a minimum of 60° with a maximum of 75°. Years ago I saw excellent crops produced in eight-inch pots on shelves near the glass in pinestoves. In this location the soil is of course of the same temperature as the atmosphere, and herein lies probably the secret of success in growing Beans under glass, whether they be in pots or planted on a bench. Raised benches are therefore preferable,

with pipes running below or under the benches, to keep a congenial warmth in the soil; this will induce healthy root action and substantial, steady growth. They cannot be grown successfully through the short days when the roots are much cooler than the tops. In our climate, where sunshine is abundant, the bench system is to be preferred to pot culture, as it requires much less labor.

As to the variety, a strain should be selected that does not produce an overabundance of foliage, especially through the shortest days, and also those kinds that mature quickly. There are quite a number of varieties that can be grown successfully under glass.

Beans delight in a rich, mellow soil, well supplied with humus. Select soil of the same nature that grows them satisfactorily in the garden. This crop will make a rapid growth with plenty of moisture at the roots, combined with sufficient heat to produce a healthy, luxuriant foliage. The best material for enriching the soil is thoroughly decayed farmyard manure, adding enough to produce a substantial growth. The Beans may be grown in about five inches of soil on raised benches, planted in rows sixteen inches apart and one inch apart in the rows. Cover the seed with about one inch of soil. From early maturing varieties Beans may be gathered in seven weeks after planting. If plantings are made about every ten days, a constant supply can be maintained. A temperature of 60° to 65° by night and 75° by day is agreeable to a healthy development. Air must be admitted whenever the weather permits, as too much



BEETS

There is always a call for tender young Beets. The only way to secure a supply during the Winter is by producing them under glass

coddling invites disease and mildew. The latter will play havoc with a batch of Beans in a short time, and the same may be said of red spider. When these once get a start, dryness of the air will encourage their rapid spread.

The foliage may be sprayed every bright day until the plants begin to bloom; keep it a bit drier during the flowering period, but never allow Beans to suffer for want of moisture at the roots at any time.

When the crop is gathered, the vines may be cleared off and the beds re-

BEAN BLACK VALENTINE

The excellent qualities of Black Valentine have long been recognised. It is a prolific cropper, both in the open and under glass. Responds admirably to the forcing process

planted, after a sprinkling of bone or wood ashes. If fertilizers are applied in this manner, the roots will get the benefit gradually. During the short Winter months I prefer this method of feeding to surface dressing or liquid manure.

The main factor of success with this crop is a suitable house, where it will get plenty of light and sun. In such a location, and with reasonable care, there

should be no difficulty in producing a good supply of young Beans for Winter use. I do not recommend this crop for commercial purposes, as the returns are much lighter than from such crops as Lettuce, Tomatoes, etc., but it is an excellent crop for private requirements, and its excellent qualities as a forced vegetable have long been recognized. Red spider and mildew are two of its worst enemies, which will spread rapidly if once started. The only safeguard against these pests is a steady temperature and spraying the foliage when the weather is clear.

As to varieties, Black Valentine is one of the best, a healthy grower and heavy cropper. Other good varieties are Selected, Ne Plus Ultra, Wonder of France, Sutton's Forcing, and Osborn's Forcing, all of which will crop well under glass.

CHAPTER XL

SEA KALE AND CHICORY

A CONSIDERABLE quantity of Sea Kale is forced in Europe during the Winter and early Spring; most establishments, in fact, set apart quite a plot for this vegetable and devote a good deal of attention to it. It may be forced in the open, or the crowns can be lifted and forced inside. To ensure thorough blanching it must be grown in a dark place, as, for instance, a mushroomhouse. Being a native of England, it naturally does not require a high temperature; the crowns would probably refuse to start if subjected to high heat. When grown out of doors, it will make a strong, vigorous growth in a temperature of 50° to 55°; therefore when it is brought into the forcing process, it will make a stronger and more substantial growth with a moderate heat. This particularly holds good when it is first started up.

When the forcing of Sea Kale is contemplated, the best mode of producing strong crowns should be considered. An open location is to be preferred; the foliage will be weak if the plant is grown in a shady place. Any good garden soil should produce a satisfactory growth, though it should not be of a very heavy texture, but rather a rich, deep, sandy loam, or such as will produce good Asparagus, with about the same treatment as to manure, etc. Nitrate of soda may be applied a couple of times during the season of growth, sown broadcast between the rows; this stimulates a healthy, clean growth.

The plants may be increased by seed or from root cuttings; the latter are preferable when the stock is available, as they grow into plants suitable for forcing in less time than seedlings. When seed is used, sow it in the Spring in drills two feet apart and thin out to six or eight inches in the rows. The following season prepare a piece of ground for transplanting, as one-year-old seedlings are not strong enough for forcing. At this planting more space must be given for full development; two and one-half or three feet between the rows is not too much, with three feet apart in the rows. When lifting plants for transplanting, the top of each, or the crown bud, should be cut off, as a preventive against running into seed. By this method new crowns are formed, and there is not much danger of the plants producing seed after being planted. Insert them so that the crown will be a couple of inches below the surface. Encourage a free growth as they come up; a mulch of manure may be given occasionally, especially in a dry spell.

When digging up plants for forcing, some of the roots may be secured for

stock, although they should not be robbed of many. It is better to grow a few stock plants solely for root cuttings. Medium-sized root cuttings are preferable to oversturdy ones, and the young roots will ultimately make better plants than would be obtained from transplanting older and thicker parts. At times, when stock is somewhat scarce, root cuttings are made from plants that have been forced, but I do not approve of this method, for the constitution of a plant which has gone through the forcing process is considerably weakened, and it is not a fit subject for reproduction.

Root cuttings should be made four or five inches in length. Cuttings set out in early Spring should make plants strong enough for forcing by the following Winter. The number of plants intended for Winter forcing should be lifted before hard freezing sets in, and stored in a cool, moist place. Introduce them into heat from December on, a batch about every ten days. Insert the roots in a loose, moist, open soil, placing them rather close together, as the blanched sprouts should be cut before they get very large, or when they are four inches to six inches long; they are then crisp and tender. They do not require much water, provided the material around the roots is moist.

A mushroomhouse is the best place for forcing Sea Kale, but before being put into it the plants might be acclimatized for a few days in a cool greenhouse This can be done with very little trouble by providing boxes deep enough and of a size to be handled easily, and placing the crowns in them, so that they need not be disturbed again. Remove them to the mushroomhouse as they show signs of growth. While this may involve a little extra labor, the growths will be stronger.

Toward Spring tender blanched sprouts may be had from the beds outside, without lifting, with the aid of Sea Kale pots or large drain pipes, and fresh stable manure placed around them. This method brings them in considerably ahead of their natural season.

CHICORY

Chicory can be forced in the same way as Sea Kale. The French probably use more Chicory for salads than any other vegetable. A native, also, of England, it may be brought into growth with a comparatively low temperature. It is cultivated in the same way as Endive; in fact, Witloof, which is the best for forcing, is often called French Endive.

The seed should be sown late in the Spring, in drills eighteen inches apart, and when large enough, thin to about eight inches in the rows. This is preferable to transplanting as they produce long, tapering roots. Before sowing, the soil should be cultivated deep. It should be fairly rich, but without containing new manure. The best time to apply the manure is the Fall, when most of the leaves die down. Dig the roots up carefully before hard freezing sets in and store them in a cool place. Two or three weeks before the blanched roots are wanted, put a batch in the mushroomhouse, or some other dark place where a temperature of about 50° can be maintained.

The roots should be planted in some light material, with just enough moisture to start the fibers into motion. Have the crowns projecting about one-half

inch out of the soil. The leaves, when grown in the dark, will be a delicate, creamy white. They may be cut for use when they are about a foot long. By placing fresh roots about every ten days a constant supply may be had.

Chicory is very tender when thoroughly blanched, and is much liked as a salad, being wholesome with an agreeable, slightly bitter flavor. As a forcing plant, it requires very little care or attention. The main point is not to give the roots too much water. It may be had without the aid of either greenhouse or mushroomhouse, if there is a cellar at hand warm enough to produce growth. The roots may be grown in the garden during the Summer, in preparation for the Winter. It is interesting to watch this plant develop, while everything is dormant outside, quite aside from the utilitarian aspect. Witloof Chicory is used both as a vegetable and salad.

A surprising number of vegetables and salads can be produced with comparatively little cost, if every available space is systematically occupied throughout the forcing season. And the successful production of these greens is a source of pleasure and enjoyment alike to the grower and employer.

CLASSIFIED INDEX

FRUITS UNDER GLASS

APPLES. See Pot Fruit.

APRICOTS. See Pot Fruit.

CHERRIES. See Pot Fruit.

FIGS: Page
- Drainage . . . 159
- Feeding . . . 160, 163, 164
- Gathering the Fruit . . . 164
- Planting . . . 160, 162
- Propagation . . . 158
- Pruning and Training . . . 164, 165
- Root Pruning . . . 162
- Second Crop, Preparations for:
  - Pinching . . . 162
  - Temperature—Pruning . . . 163
- Soil . . . 160
- Temperature . . . 160
- Varieties Best Suited for Forcing . . . 165
- Ventilation . . . 159

GRAPES:
- Commercial Grape Culture . . . 65, 66
- Cool Storehouse . . . 82, 83
- Cultural Directions:
  - When to Start Early, Mid-season and Late House—Temperature . . . 38
  - Airing the House . . . 38, 40, 41
  - Spraying . . . 40
  - Feeding . . . 41
- Disbudding . . . 53
- Exhibition, Handling Grapes for . . . 83, 84, 85
- History of the Grape Vine . . . 17, 18
- Houses Best Adapted for Growing Grapes:
  - Size—Ventilation—Elevation . . . 20
  - Heating—Piping . . . 21
- Insects and Diseases:
  - Mealy Bug—Red Spider . . . 75
  - Thrips—Vine Weevil—Mildew . . . 76
  - Scalding of Berries—Rust . . . 78
  - Shanking . . . 79
- Keeping Qualities of Grapes . . . 80, 81
- Packing Grapes for Forwarding . . . 83
- Pinching or Stopping Shoots . . . 54, 55, 56
- Planting Young Vines:
  - When to Plant—Selection of Canes—Soil—Fertilizer—Watering . . . 43
  - Plants Rooted from Eyes—Correct Trellis . . . 45, 46
- Pot Culture:
  - Vines Grown from Eyes . . . 85, 86
  - Soil—Fertilizer—Repotting—Cutting Back . . . 86
  - Watering—Feeding—Temperature—Methods of Training Vines . . . 88
  - Varieties Best Adapted for Pot Work . . . 89
  - Pot Grape Vines for Fruiting—Temperature—Watering . . . 89

GRAPES—Continued.

Page

Propagation, Various Systems of:
When to Propagate—Propagation from Eyes 22
By Layering—By Inarching 24
By Grafting—By Seed Cross Fertilization 26

Pruning the Vine, Methods of:
Young Canes—The Short Spur System 47, 48, 49
Long Rod System 50, 51
Tying the Vines—Adventitious or Aerial Roots 51
Keeping Fruit Healthy 52
Setting the Fruit 56, 57
Thinning Grapes 59, 61, 63

Varieties Best Adapted for Early and Late Use:
Best Varieties for Pot Vines 68
Muscat Grapes 69
Sweetwater Grapes 70
Vinous Grapes 72

Vine Borders:
Inside and Outside Borders, Location 29
Draining a Border 30, 31
Fertilizer 32, 33, 34
Watering—Root Action 35

MELONS:
Feeding 174, 175
Fertilizer 169
Gathering the Fruit 177
House, Style of 167, 169
Insects 177
Mildew 178
Planting 172, 173
Seedlings 167, 170
Setting the Fruit 173, 174
Soil 169
Temperature 169
Varieties 178
Watering 174
Young Plants, Raising 170

PEACHES and NECTARINES:
Borders and Their Construction:
Drainage 96
Soil—Fertilizer 97
Budding 92, 94

Cultural Directions:
Cleanliness in the House—Soil—Fertilizer 102
Feeding 103
Temperature—Spraying—Ventilation—Watering 104
Disbudding and Tying the Young Growths 105, 106

Diseases and Insect Pests:
San Jose Scale 116, 118, 119
Peach Borer 116, 117
Green Fly—Mildew—Fruit Rot or Blight 119
Gathering the Fruit 109
Treatment of Trees after Fruit is Gathered 110, 112
House or Houses Best Adapted for Growing 94
Span Roof—Location—Ventilation 95
Crosswise System—Size of House—Leanto or Three-Quarter Span—Location 96

Planting:
When to Plant—Selection of Stock 99
Soil—Fertilizer—How to Plant 101
Pruning and Training 112, 113, 114, 115
Thinning the Fruit 107, 108, 109
Varieties for Forcing Purposes, Selection of 121, 122, 123, 124, 126

PEARS. See Pot Fruit.

PINEAPPLES: Page
Culture 194, 195, 196
Feeding 195, 196, 197
Fertilizer 192, 194, 195
House, Suitable 191, 192
Insects:
Mealy Bug—Red Spider 200
Pot System:
Atmosphere—Size of Pots—Repotting—Bottom Heat—Drainage 199
Propagation 192, 193
Shading 196
Soil 192, 194
Spraying 195
Temperature 191, 192, 194
Ventilation 198
Varieties 200
Watering 196

PLUMS. See Pot Fruit.

POT FRUIT:
Advantages 127, 128, 129
Cultural Directions:
When to Start into Growth—Temperature 132
Ventilation—Watering 133
Spraying—Hand Fertilization 134
Feeding 134, 135, 137
Diseases and Insect Pests:
Green Fly 142
Red Spider—Leaf Roller 144
Mildew—Borer 145
Houses Suitable for Pot Fruit 129
Size—Style—Ventilation—Temperature 131
Pinching the Shoots 138, 139
Thinning the Fruit 139, 141
Treatment of Trees After Fruit is Gathered 146
Soil 147
Repotting—Drainage 148
Pruning 148, 149
Varieties Adapted for Orchardhouse Work:
Peaches and Nectarines 152
Pears 152
Plums 153, 154
Cherries 154
Apricots 155, 156
Figs 156
Apples 156, 157

STRAWBERRIES:
Crown, Growing the 185
Drainage 187
Fertilizer 184
Forcing, Process of 183
Frost 188
Fungus 189
Gathering the Fruit 184
Insects:
Red Spider—Green Fly 188
Potting 185
Runners, Selecting the 181, 182
Soil 185, 186
Temperature 180, 183
Varieties for Forcing 189, 190
Watering 184, 187

VEGETABLES UNDER GLASS

ASPARAGUS: Page
Crowns, Lifting the . . . 240
Methods of Growing . . . 241, 242
Temperature . . . 240

BEANS:
Feeding . . . 246
Insects and Diseases . . . 247
Soil . . . 245
Spraying . . . 246
Temperature . . . 244, 245
Varieties . . . 247
Ventilation . . . 246

BEETS . . . 243, 244

CARROTS . . . 243

CAULIFLOWER:
Feeding . . . 213, 215
Insects . . . 216
Soil . . . 213
Sowing the Seed . . . 215
Spraying . . . 213
Transplanting . . . 215
Varieties . . . 216
Watering . . . 215

CHICORY:
Feeding . . . 249
Soil . . . 249
Sowing the Seed . . . 249
Temperature . . . 249

CUCUMBERS:
Diseases . . . 230, 231
Feeding . . . 228
House, Size and Style . . . 227
Insects . . . 230, 231
Pruning . . . 230
Setting the Fruit . . . 230
Soil . . . 227, 228
Sowing the Seed . . . 227
Temperature . . . 227, 228
Training . . . 230
Varieties . . . 231
Ventilation . . . 228
Watering . . . 228

LETTUCE:
Distance to Plant . . . 208
Feeding . . . 209
Insects and Diseases:
Fungus . . . 210
Aphis . . . 210, 211, 212
Soil . . . 205
Sowing . . . 205
Temperature . . . 208
Transplanting . . . 207
Varieties . . . 212
Ventilation . . . 208, 209
Watering . . . 207, 209

MUSHROOMS: Page
Atmosphere 235
Gathering 235
Location Suitable for Growing 234
Manure, Desirable 234
Temperature 236
Watering 235

RADISHES:
Fertilizer 217
Gathering 218
Soil 217
Sowing the Seed 217, 218
Varieties 218

RHUBARB:
Fertilizer 238
Forcing, Methods of 237
Freezing and Roots 238
House, Construction of 237
Temperature 237, 238
Varieties 239
Watering 238

SEA KALE:
Feeding 248
Root Cuttings 249
Soil 248
Sowing the Seed 248
Temperature 248

TOMATOES:
Catch Crop, As a 224
Feeding 221
House, Suitable 220
Insects and Fungous Diseases:
Tomato Rust or Mildew 224
Fruit Rot—Clubroot—White Fly 225
Planting and Training 220
Setting the Fruit 222, 223
Soil 220
Sowing the Seed 220
Spring Crop, Preparations for 224
Temperature 221, 222
Varieties 225
Ventilation 221, 222
Watering 221

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